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VOLUME III APPENDICES, LITERATURE CITATIONS

APPENDIX A1
CETACEA EXHIBITS

CETACEAN/PINNIPED SIGHTING CARD

1. Program (1=cet.,2=pinn.,3=bird)	1	__
2. Observer	2-3	__ __
3. Date (mo/day/yr)	4-9	__ __ __ __ __ __
4. Trip Number (1=A,2=S,)	10-12	__ /__ __
5. Time (local)	13-16	__ __ __ __
6. Position (lat.long)	17-25	__ __ __ __ __ __ __ __
7. Specific Location	26-28	__ __ __
8. Compass Heading (°M)	29-31	__ __ __
9. Number of subadults	32-34	__ __ __
10. Altitude (ft)	35-38	__ __ __ __
11. Association	39	__
12. Species	40-41	__ __
13. Number	42-45	__ __ __ __
14. Number of newborns	46-47	__ __
15. Sex (1=M,2=F,3=♀♂)	48	__
16. Direction of Movement (°M)	49-51	__ __ __
17. Group Formation	52	__
18. Behavior	53-54	__ __
19. Marked/Radio Sighting (1=yes)	55	__
20. Relative Sighting Direction	56-58	__ __ __
21. Sighting Angle	59	__
22. Sighting Distance (ft)	60-63	__ __ __ __
23. Water Depth (fathoms)	64-67	__ __ __ __
24. Photo Number (roll/frame)	68-73	__ __ __ /__ __ __
25. Reliability of Sighting	74	__
26. See Data Book (1=yes)	75	__

CETACEAN CODING SHEET

2 Observer

01 M Benton
02 M Bonnell
03 K Briggs
04 D Day
05 D Dettman
06 T Dohl
07 G Farrens
08 J Hall
09 C Heath
10 L Hobbs
11 M Honig
12 G Hunt
13 L Jones
14 B LeBoeuf
15 D Lewis
16 K Norris
17 S Piers
18 M Pierson
19 P Poodry
20 M Quammen
21 P. Sund
22 E Tyler
23 R. Guess
24 Guest Observer

4 Trip Number

1 Aerial
2 Ship
3 Historical

11 Association

1 cetacea
2 pinniped
3 bird
4 cetacea/bird
5 cetacea/pinniped
6 pinniped/bird
7 cetacea/bird/pinniped
8 fish (e g bait)
9 Kelp

12 01 Unidentified large > 40
02 Unidentified medium 40 20'
03 Unidentified small < 20'

10-19 baleen whales
10 blue
11 fin
12 sei
13 minke
14 Bryde's
15 gray
16 humpback
17 right

20-49 toothed whales
20 sperm
21 killer
22 false killer
23 Globicephala sp
24 G macorhyncha
25 G scammoni
26 Kogia sp
27 K simis
28 Kogia breviceps
29 Lagenorhynchus
30 Dall porpoise
31 harbor porpoise
32 Steno
33 Stenella sp
34 S caeruleoalba
35 S attenuata
36 S longirostris
37 Delphinus
38 Lissodelphis
39 Tursiops
40 Grampus
41 M carlhubbsi
42 M stenjegeri
43 M ginkodens
44 Mesoplodon sp
45 Baird s whale
46 bottlenoise whale
47 Cuvier s beaked whale

50-59 pinnipeds
50 unidentified
51 Zalophus
52 Eumetopias
53 Callorhinus
54 Arctocephalus
55 Mirounga
56 Phoca

60 Enhydra

17 School Formation

1 ranked - chorus line
2 tightly grouped (discoidal)
3 spread with sub-schools
4 spread with sub groups
5 scattered
6 linear or filed
7 pod
8 singleton

18 Behavior (mark see data book for multiple behaviors)

01 aerial
02 feeding
03 sexual
04 mother/young
05 synchronous diving
06 aggressive
07 bow riding
08 non specific contact/play
09 breezing (rapid swimming)
10 porpoising
11 milling
12 swimming
13 spy hop
14 breach
15 fluting
16 loafing

19 Marked/Radio Sighting

1 yes
2 stranding
3 capture
4 kill

21 Sighting Angle

1 0°
2 15
3 30
4 45
5 60
6 75
7 90

25 Reliability of Sighting

1 certain
2 probable
3 questionable

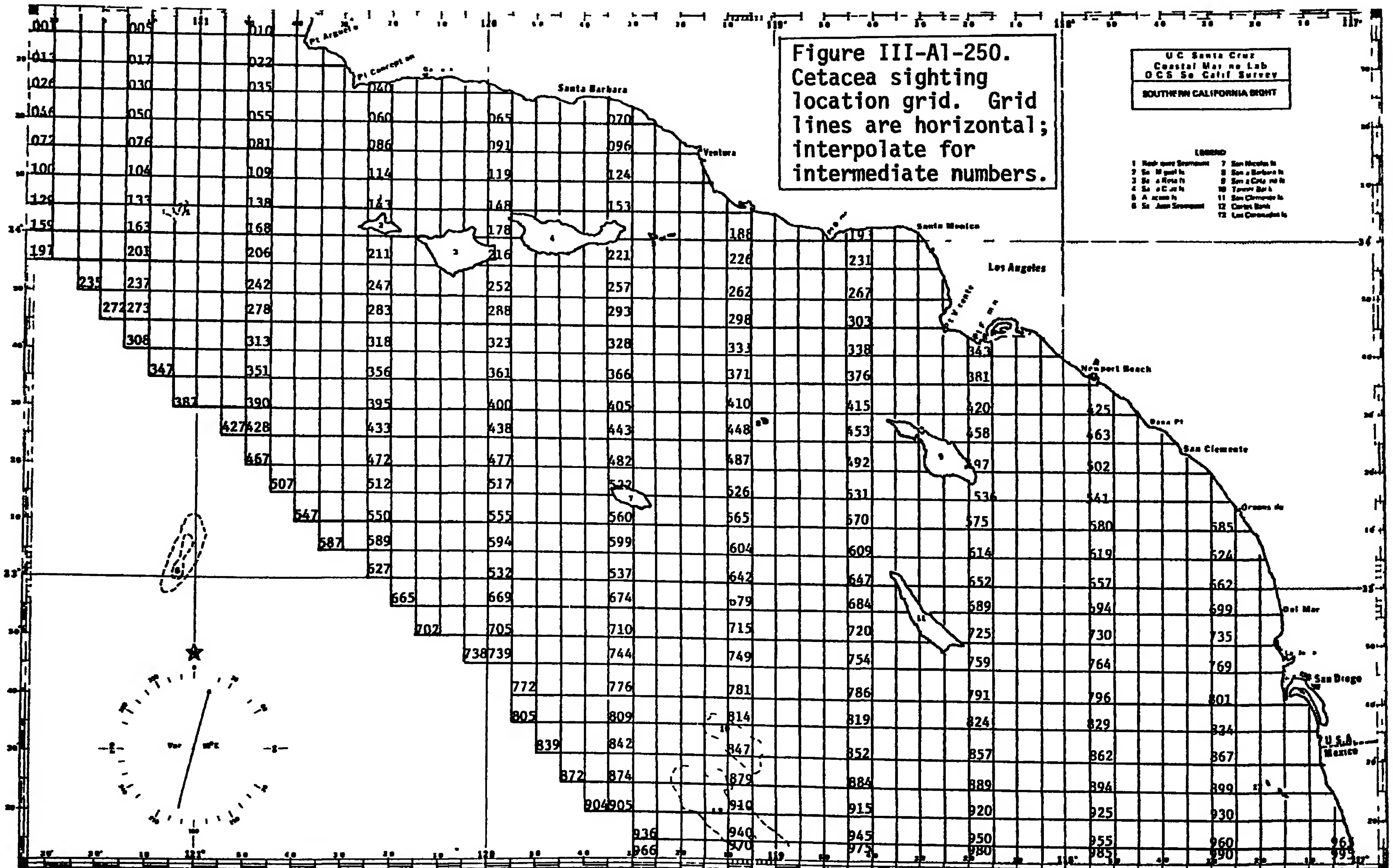

Figure III-A1-250. Cetacea sighting location grid. Grid lines are horizontal; interpolate for intermediate numbers.

ENVIRONMENTAL CARD

1.	Program (4=cet.,5=pinn.,6=bird)	1 __
2.	Observer	2-3 __ __
3.	Date (mo/day/yr)	4-9 __ __ __ __ __ __
4.	Trip Number (A=1,S=2,)	10-12 __ /__ __
5.	Time (local)	13-16 __ __ __ __
6.	Position (lat,long)	17-25 __ __ __ __ __ __ __ __ __
7.	Air Temp(°C)	26-27 __ __
8.	Water Temp(°C)	28-29 __ __
9.	Humidity	30-31 __ __
10.	Light level (ft-c x 100)	32-34 __ __ __
11.	Sun Glare	35 __
12.	Weather Conditions	36 __
13.	Cloud Cover	37 __
14.	Sea State (Beaufort Scale)	38 __
15.	Wind Direction	39-41 __ __ __
16.	Wind Speed (kts)	42-43 __ __
17.	Barometer (millibars)	44-47 __ __ __ __
18.	Barometer Trend	48 __
19.	Forel Number	49 __
20.	Debris	50 __
21.	Moon Phase	51 __
22.	Tide (minus/plus)	52-53 __ /__
23.	See Data Book (1=yes)	54 __

TRIPS 100-199 SORTED BY DATE -- 311 RECORDS
PAGE 1

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
2	51675	101	1707	330011800	693	29	24
2	51675	101	1352	334511830	341	31	2
2	51675	101	1740	334011800	385	15	1
6	51875	101	1530	332011834	533	39	10
10	51875	101	1247	340111906	188	13	1
10	51875	101	1247	340111906	188	13	1
10	51875	101	1154	335411930	258	29	2000
6	51875	101	1525	330411839	648	30	1
6	51875	101	1530	332011834	533	39	10
10	52075	101	1227	32411743	0	37	100
10	52075	101	1227	324311743	798	37	100
2	62775	102	1523	334712000	288	29	1
2	62975	102	1321	324911830	757	37	12
2	63075	102	1254	321211750	0	29	5
6	7 175	102	1400	340312019	174	29	10
21	7 175	102	1520	340011925	223	3	0
11	7 175	102	1500	340011931	221	0	1
6	7 175	102	1400	340312019	174	29	10
21	7 175	102	1520	340011925	223	3	0
21	7 275	102	1015	34011931	0	16	1
11	7 275	102	1255	331511924	562	15	4
11	7 275	102	1353	332911837	454	29	30
11	7 275	102	1255	331511924	562	15	4
21	7 275	102	1015	340011931	221	16	1
11	7 275	102	1353	332911837	454	29	30
6	7 375	102	1515	325711733	698	29	1700
11	7 375	102	1335	331111808	577	2	1
11	7 375	102	1240	330111836	648	3	0
21	7 375	102	1530	330111729	662	29	800
11	7 375	102	1335	33111808	0	2	1
11	7 375	102	1240	330111836	648	3	2
21	7 375	102	1530	330111729	662	29	800
21	73175	103	1120	341412105	106	40	5
21	73175	103	1202	335712057	204	40	8
21	73175	103	1202	335712057	204	40	8
21	73175	103	1120	341412105	106	40	5
8	8 275	103	1506	325011833	756	40	80
8	8 275	103	1652	325311800	729	37	5
8	8 275	103	1612	322311834	917	37	11
8	8 275	103	1603	322011854	943	37	300
8	8 275	103	1506	325011833	756	40	80
8	8 275	103	1506	325011833	756	40	80
8	8 275	103	1612	322311834	917	37	11
8	8 275	103	1652	325311800	729	37	5
8	8 275	103	1603	322011854	943	37	300
8	8 375	103	1512	323611730	834	37	500

TRIPS 100-199 SORTED BY DATE -- 311 RECORDS
PAGE 2

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
8	8 375	103	1338	322011759	954	10	1
8	8 375	103	1420	322011814	951	10	1
8	8 375	103	1611	323511747	863	37	25
8	8 375	103	1338	322011759	954	10	1
8	8 375	103	1420	322011814	951	10	1
2	8 475	103	1230	322011813	951	29	20
2	8 575	103	1207	322011840	946	29	50
23	81175	105	1304	324511921	778	37	1000
6	81375	104	1524	335311947	254	40	2
6	81375	104	1416	340912030	148	40	3
6	81375	104	1330	340112027	172	37	2000
6	81375	104	1342	340312103	165	34	500
6	81375	104	1425	340812029	148	40	3
6	81375	104	1442	333211940	404	37	100
23	91175	105	1615	331311835	572	37	1000
6	91175	105	1314	324711923	746	2	1
23	91175	105	1607	325411834	722	29	100
6	91275	105	1644	325511839	721	37	500
6	91275	105	1721	330511823	651	37	25
2	102375	106	1257	331711736	544	37	1
2	102375	106	1237	322711757	893	21	100
2	102375	106	1358	331311815	576	37	20
2	102475	106	1304	323311915	846	37	1
2	102475	106	1040	334011830	379	37	1
2	102475	106	1400	324411930	777	37	4
2	102475	106	1300	323311915	846	40	1
2	102475	106	1300	323311915	846	40	12
2	102475	106	1205	324811905	750	40	1
2	102475	106	1400	324411930	777	29	12
2	102475	106	1400	324411930	777	29	20
2	102475	106	1530	332611906	448	37	25
2	102475	106	1300	323311915	846	40	1
2	102475	106	1205	324811905	750	37	20
2	102475	106	1645	335611848	230	23	5
2	102475	106	1550	332711905	449	37	9
2	102475	106	1330	322011907	940	37	250
2	102475	106	1355	323811930	810	37	20
2	102475	106	1400	324411930	777	11	1
2	102475	106	1400	324411930	777	40	6
2	102575	106	1216	322011910	940	37	100
2	102575	106	1049	335611915	225	23	3
2	102575	106	1054	335311915	261	30	1
2	102575	106	1341	332811951	439	11	2
2	102575	106	1443	334911958	288	37	2
2	102675	106	1020	341812006	89	30	2
2	102675	106	1300	330011934	674	30	4

TRIPS 100-199 SORTED BY DATE -- 311 RECORDS
PAGE 3

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
2	102675	106	1211	335312030	246	29	150
2	102675	106	1320	330611930	600	37	9
2	102675	106	1019	341812002	90	30	3
2	102675	106	1359	335811930	222	30	1
2	102675	106	1016	341811958	91	30	3
2	102675	106	1017	341812000	91	30	4
21	102775	106	1210	341911936	95	30	4
21	102775	106	1225	342011937	95	29	10
21	102775	106	1210	341911936	95	23	0
21	102775	106	1210	341911931	96	3	0
21	102775	106	1148	335411917	260	23	12
21	102775	106	1136	334911856	300	23	6
21	102875	106	1300	330912029	588	11	3
21	102875	106	938	34001903	0	3	2
21	102875	106	1215	331012000	594	11	1
21	102875	106	1331	330411956	632	3	12
21	102875	106	1248	330812030	588	11	1
21	102875	106	1021	340311937	182	30	1
21	102875	106	1154	330512020	628	37	500
21	102875	106	1248	330812030	588	30	3
21	102875	106	1215	331012000	594	37	500
21	102875	106	1133	333411954	401	37	1000
21	102875	106	1334	333011946	440	37	675
23	102975	106	1525	331511832	572	29	100
23	102975	106	1510	330611837	610	3	5
23	102975	106	1328	323511932	842	3	27
23	102975	106	1100	330612004	593	37	100
23	102975	106	1120	331511943	558	37	1000
23	103075	106	1138	32511716	0	39	3
23	111175	107	1539	335212000	252	13	2
23	111275	107	1030	331311953	556	29	10
23	111275	107	1510	324311931	776	37	60
23	111275	107	1337	332511834	494	37	25
23	111275	107	1202	332412023	472	37	50
23	111275	107	1025	331511915	564	29	100
23	111275	107	1002	332211942	460	29	300
23	111275	107	1527	324411929	777	38	25
23	111275	107	1031	330911950	596	29	500
23	111275	107	1429	332411843	492	3	2
23	111275	107	1551	323511914	846	2	1
23	111275	107	1047	325012010	738	40	50
23	111275	107	1202	332412023	472	40	300
23	111275	107	1548	323011920	877	29	25
23	111275	107	1110	325712019	665	3	3
23	111275	107	1202	332412023	472	38	25
23	111375	107	1143	324311836	787	29	24

TRIPS 100-199 SORTED BY DATE -- 311 RECORDS
PAGE 4

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
23	111375	107	1320	325411751	730	37	2000
23	111375	107	1431	332611813	459	23	12
23	111375	107	1121	323111849	851	30	12
23	111375	107	1053	323311937	841	30	8
23	111375	107	1045	322911908	879	13	2
23	111375	107	1015	330611905	605	37	25
23	111375	107	1240	325011821	758	29	100
23	111375	107	1206	324811826	757	3	1
23	111375	107	1500	330811739	622	37	200
23	111475	107	1324	322511746	926	1	1
23	111475	107	1448	331211809	577	23	16
23	111475	107	1620	333011817	458	29	3
23	111475	107	1520	325911808	691	29	30
23	111475	107	1345	323011752	894	29	600
23	111475	107	1215	330311722	663	37	500
23	111475	107	1537	325711817	689	29	200
23	111475	107	1324	322511746	926	13	3
2	121675	108	1331	332011830	534	23	24
2	121675	108	1555	335511922	259	30	1
2	121675	108	1535	335511950	254	15	1
2	121675	108	1138	330411730	662	23	12
2	121775	108	1319	325911830	687	37	1
2	121775	108	1646	323111800	861	38	1
2	121775	108	1643	322611800	893	38	3
13	121775	108	1627	322011827	948	30	12
2	121775	108	1618	322011845	945	30	1
2	121775	108	1614	322011852	943	38	17
2	121775	108	1602	322411900	912	30	1
2	121775	108	1601	322411900	912	30	4
2	121775	108	1600	322411900	912	30	4
2	121775	108	1556	323011900	881	30	4
2	121775	108	1543	324711900	751	38	500
2	121775	108	1533	325411900	717	38	4
2	121775	108	1528	325711900	681	38	20
2	121775	108	1520	325711900	681	40	2
2	121775	108	1449	333011854	451	30	4
21	122175	108	1432	331611815	537	51	5
21	122175	108	1310	331911838	532	23	200
21	122175	108	1329	331811819	536	23	150
21	122175	108	1434	331711814	537	3	6
21	122175	108	1410	330211832	649	3	6
21	122175	108	1402	330011832	686	15	4
21	122175	108	1513	330611810	616	37	100
21	122275	108	1209	332111832	494	15	2
21	122275	108	1130	331811824	535	23	30
21	122275	108	1347	334511825	342	15	2

TRIPS 100-199 SORTED BY DATE -- 311 RECORDS
PAGE 5

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
21	122275	108	1130	331811824	535	39	22
21	122275	108	1252	332311829	495	15	3
21	122275	108	1415	333211834	417	15	2
21	122275	108	1338	332811828	456	15	1
21	122275	108	1252	332311829	495	23	15
21	122275	108	1238	331911828	534	23	45
21	122275	108	1124	331711819	536	23	18
21	122275	108	1238	331911828	534	15	2
21	122275	108	1109	332711815	459	23	50
21	122275	108	1103	333311815	421	23	30
6	1 576	109	1225	330111837	648	15	3
2	1 676	109	1551	345511908	30	30	3
2	1 676	109	1300	332811930	444	30	2
2	1 676	109	1252	332011930	522	15	1
6	1 776	109	1457	331911817	536	37	12
6	1 776	109	1027	331911825	535	23	84
6	1 776	109	958	331911823	535	23	24
6	1 776	109	845	332111819	497	23	20
6	1 776	109	1230	332911837	454	15	4
6	1 776	109	1503	331811817	536	15	4
6	1 776	109	1027	331911825	535	15	3
6	1 776	109	953	331811818	536	15	2
6	1 776	109	952	331811818	536	23	46
6	1 776	109	1135	331811826	534	15	4
6	1 776	109	1135	331811826	534	39	9
6	1 776	109	1027	331911825	535	39	8
6	1 776	109	1030	332311829	495	23	70
6	1 776	109	852	331911818	536	23	40
6	1 776	109	1500	331911817	536	23	40
6	1 776	109	845	333211181	0	39	10
6	1 776	109	1458	331911817	536	23	46
6	1 776	109	1442	332311830	495	15	5
24	1 776	107	220	332711902	449	2	1
9	1 876	109	1541	325011742	766	38	200
9	1 876	109	1029	321211910	0	1	1
6	1 876	109	1530	323611801	827	37	30
9	1 876	108	1605	330711721	625	15	2
9	1 876	109	1424	322311835	917	37	500
9	1 876	109	1607	325811718	701	15	4
9	1 876	109	925	325611847	683	38	275
9	1 876	109	1310	332711743	465	15	4
9	1 876	109	1210	325411832	722	15	2
9	1 876	109	1326	332411740	505	15	1
9	1 876	109	855	332011818	536	23	14
6	1 876	109	1600	330911721	625	15	2
6	1 876	109	1530	323611801	827	23	45

TRIPS 100-199 SORTED BY DATE -- 311 RECORDS
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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
21	12076	110	1520	342612027	39	15	2
21	12076	110	1057	335011917	296	15	3
21	12176	110	1220	342612024	40	15	2
21	12176	110	1338	340312117	162	21	21
21	12176	110	1240	342312032	58	15	3
21	12176	110	1500	341112043	110	40	13
21	12176	110	832	340511958	178	15	5
21	12176	110	930	333411948	402	29	12
21	12176	110	1150	342312003	64	15	11
21	12176	110	957	331211949	557	3	6
21	12176	110	957	331211949	557	11	3
21	12176	110	930	333411948	402	51	6
23	21276	112	1038	334011820	381	15	4
21	21376	111	1411	340211930	184	29	5
21	21376	111	1127	342411954	66	15	1
21	21376	111	1523	335411926	258	15	1
21	21376	111	1430	335611944	219	40	4
21	21376	111	1046	341811943	94	15	1
21	21376	111	1046	341811943	94	15	2
21	21376	111	1104	342411949	67	15	2
21	21376	111	1109	342411951	66	15	1
21	21476	111	1206	332611900	450	30	8
21	21476	111	1331	331711822	535	23	13
21	21476	111	1610	323811934	809	1	2
21	21476	111	1625	323011920	877	11	1
21	21476	111	1530	331311856	567	38	25
21	21476	111	1625	323011920	877	38	30
21	21476	111	1520	331911850	530	38	16
21	21476	111	1355	332611834	455	23	43
21	21476	111	940	333011902	449	30	2
21	21476	111	1330	331711822	535	15	3
21	21476	111	1344	332511829	495	23	26
21	21476	111	1546	330211909	642	38	100
21	21476	111	1530	331311856	567	29	2
21	21576	111	1442	324911716	771	15	2
23	31076	112	1619	332411736	505	15	2
23	31076	112	1238	322711718	901	15	3
23	31076	112	1244	322611720	901	37	8
23	31076	112	1617	332211735	506	15	2
23	31076	112	1605	331111723	586	15	3
23	31076	112	955	334111612	344	15	3
23	31076	112	1420	330611721	625	15	2
23	31076	112	1417	330411719	664	15	4
23	31076	112	1007	333311755	425	37	450
23	31076	112	1349	324711719	771	29	18
23	31076	112	1349	324711719	771	15	2

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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
23	31076	112	1230	323411708	871	15	1
23	31076	112	1610	331511727	585	15	2
23	31076	112	1203	324911720	771	15	1
23	31076	112	1343	323711729	834	15	2
23	31076	112	1325	322011746	956	15	4
23	31076	112	1024	332411747	503	37	2500
23	31076	112	1050	331111731	584	37	40
23	31076	112	1244	322611720	901	15	3
23	31076	112	1224	323811714	837	15	4
23	31076	112	1210	323811716	836	15	2
23	31076	112	1054	331111731	584	37	60
23	31176	112	1647	334411812	344	15	3
23	31176	112	935	333011809	460	15	2
23	31176	112	1616	332311737	525	15	3
23	31176	112	1615	332611744	465	15	7
23	31176	112	1613	332711743	465	15	2
23	31176	112	1608	333111747	426	15	2
23	31176	112	1313	330411906	642	2	2
23	31176	112	1607	333211749	426	15	2
23	31176	112	1416	330811923	601	11	7
23	31176	112	1605	333411753	425	15	3
23	31176	112	1558	333611759	385	15	2
23	31176	112	1530	334411823	342	15	2
23	31176	112	1535	334211818	343	29	250
23	31176	112	1551	333811800	385	15	4
23	31276	112	1408	340212008	176	29	250
23	31276	112	1119	340011850	230	15	2
23	31276	112	1110	340111847	192	29	250
23	31276	112	1021	335711854	229	15	2
23	31276	112	1110	340011847	230	15	10
23	31276	112	1049	334111819	343	15	4
23	31276	112	1042	334211821	342	15	5
23	31276	112	1008	333111747	426	15	2
23	31276	112	1005	333111748	426	15	1
23	31276	112	1002	333711757	385	15	2

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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
11	1 675	220	803	335312009	250	30	4
11	1 775	220	1400	332311817	497	30	4
15	1 775	221	1332	333311948	402	29	10
8	1 975	212	1243	0 0	0	0	0
9	11075	216	1125	334311824	342	25	30
13	41975	201	1525	334011920	369	30	2
13	42075	201	1015	332711908	448	30	3
13	42175	201	1730	333011848	452	30	10
15	5 775	202	1047	333311802	423	30	6
15	5 775	202	1758	325711745	696	30	3
15	5 775	202	1745	325711745	696	37	25
15	5 775	202	1525	331211745	582	30	6
15	5 775	202	1430	331811745	543	37	4
15	5 775	202	1250	332211748	503	37	100
15	5 775	202	1212	332611753	463	15	2
15	5 975	202	1013	333511853	413	3	1
15	5 975	202	940	333511858	412	3	1
15	5 975	202	1140	333511843	415	3	1
15	51375	203	1127	340612020	150	30	1
15	52275	208	815	334811832	305	23	25
2	52775	204	715	333511803	423	3	0
7	52775	204	1937	334711947	290	38	150
7	52775	204	1920	334511944	326	38	1
7	52775	204	1810	334111932	328	30	4
7	52775	204	1737	333911928	367	30	2
7	52775	204	1900	334411939	327	29	2
7	52775	204	1857	334411939	327	30	2
7	52775	204	1855	334411939	327	30	3
7	52775	204	1840	334311935	328	30	1
2	52775	204	1138	332911900	450	3	5
2	52775	204	1119	332911857	450	3	0
2	52775	204	1057	333011852	451	29	8
2	52775	204	925	333211832	417	2	1
2	52775	204	841	333311824	419	13	1
2	52775	204	815	333411810	422	1	1
7	61975	206	955	332411940	481	1	1
7	61975	206	720	334412004	322	29	8
7	62075	206	1720	333311824	419	2	1
7	71575	207	1130	340812021	149	1	2
7	71575	207	1124	340912021	149	1	1
7	71575	207	1131	340812021	149	1	1
7	71675	207	1053	333411915	409	13	2
7	71675	207	944	334011930	367	2	1
7	71675	207	907	334411939	327	3	1
7	71675	207	835	334611945	291	2	1
7	71775	207	649	332311911	486	29	4

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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
7	71775	207	650	332311911	486	29	4
15	72275	208	710	334111822	342	23	15
15	72375	208	1644	335511942	255	30	3
15	72375	208	1330	335511938	256	13	1
15	72375	208	1256	335511952	253	13	1
15	72375	208	1126	335511908	262	13	1
15	72375	208	1748	335511952	253	13	1
15	72475	208	710	335412012	249	3	10
15	72475	208	851	333911955	362	30	5
15	72475	208	734	334912007	286	30	4
15	72475	208	925	333511952	401	3	1
15	72475	208	916	333511952	401	30	3
15	72475	208	1039	332511938	481	30	6
15	72475	208	1032	332511938	481	13	1
15	72475	208	1008	332811943	441	30	12
15	72475	208	946	333311948	402	30	1
15	72475	208	1221	332511912	486	13	1
15	72475	208	1139	332511924	484	37	1
15	72475	208	1059	332511932	482	13	1
15	72575	208	1206	323511742	864	3	215
8	72875	209	1310	334311825	342	23	40
11	72875	209	1310	334311825	342	39	25
11	72975	209	1320	332211927	483	11	1
8	72975	209	1230	332211925	484	13	1
8	72975	209	1230	332211924	484	13	1
10	72975	209	1847	334311957	323	30	5
10	72975	209	1817	333911953	362	44	1
10	72975	209	1815	333811953	362	30	5
10	72975	209	1802	333711951	362	13	1
10	72975	209	1800	333511950	402	30	3
11	72975	209	1745	333311948	402	13	1
10	72975	209	1743	333311948	402	13	1
7	72975	209	1605	333211949	402	10	1
8	72975	209	1545	333211948	402	13	2
10	72975	209	1500	332411942	480	11	1
10	72975	209	1410	332311936	481	29	150
11	72975	209	1320	332211927	483	11	1
8	72975	209	1230	332211925	484	13	1
8	72975	209	1230	332211924	484	13	1
8	72975	209	1215	332111920	485	42	1
8	72975	209	1130	332111920	485	13	1
8	72975	209	815	332111847	491	2	1
10	73075	209	1040	340012018	212	13	1
8	73075	209	908	340412001	177	13	1
11	73175	209	836	335512002	251	13	1
8	8 175	209	1245	331711829	534	13	1

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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
10	8 475	210	1634	324111730	801	37	500
8	8 475	210	1555	324311732	800	13	1
8	8 675	210	1016	324611823	758	29	120
8	8 675	210	1435	324511813	792	13	2
8	8 675	210	1315	324211810	793	37	20
10	8 675	210	1030	324311823	790	37	250
8	8 775	210	934	331111815	576	37	300
10	8 775	210	1654	323711725	835	37	6
10	8 775	210	940	331211812	576	37	500
15	82575	211	1113	334111822	342	23	10
15	82675	211	1147	335511902	263	13	2
15	82675	211	910	334711848	302	13	1
15	82675	211	1159	335511902	263	13	1
15	82675	211	1353	335511928	258	13	1
15	82875	211	819	330711855	607	10	1
15	83075	211	1040	325211745	732	37	200
8	9 175	212	1213	335811920	224	13	3
10	9 175	212	1653	335111908	262	13	1
8	9 175	212	1400	334711915	297	37	150
8	9 175	212	1247	335711919	224	39	6
8	9 275	212	720	335811929	222	13	1
23	9 275	212	1405	335311959	252	13	1
10	9 275	212	1340	335312000	252	13	2
8	9 275	212	1115	334712005	287	29	15
23	9 275	212	933	334911947	290	13	2
23	9 275	212	820	335111937	256	23	80
8	9 275	212	749	335411933	257	30	2
8	9 375	212	1430	332911839	454	39	30
23	9 475	212	1515	324211724	802	23	30
11	9 575	212	1100	324811733	768	23	90
8	9 575	212	825	323011722	900	37	1450
16	9 875	213	1145	332211848	491	39	8
4	9 875	213	1400	334011909	371	13	1
4	9 975	213	845	335412014	249	13	1
23	9 975	213	835	335412014	249	13	1
7	9 975	213	730	335412004	251	13	1
10	9 975	213	1310	340212055	167	40	60
16	9 975	213	1145	335912035	209	29	25
16	9 975	213	1145	335912035	209	37	100
16	9 975	213	1120	335812033	209	37	250
16	9 975	213	1120	335812033	209	29	540
16	9 975	213	1055	335612030	210	29	6
16	9 975	213	1047	335612030	210	37	20
16	9 975	213	1015	335612028	210	10	1
24	9 975	213	1000	335612027	210	37	45
24	9 975	213	1000	335612027	210	29	100

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
4	9 975	213	920	335612022	211	29	3
4	9 975	213	920	335612022	211	30	7
10	9 975	213	1723	335412009	250	13	1
16	9 975	213	1650	335612016	212	30	7
16	9 975	213	1630	335712020	212	37	14
16	9 975	213	1625	335712022	211	29	6
16	9 975	213	1612	335712024	211	29	5
16	9 975	213	1607	335712025	211	29	5
4	9 975	213	1600	335712026	210	29	4
24	9 975	213	1555	335812027	210	37	10
4	9 975	213	1540	335812031	209	30	4
24	9 975	213	1530	335912033	209	29	6
4	9 975	213	1520	335912036	208	37	2
23	9 975	213	1508	340012038	208	30	1
23	9 975	213	1404	340112051	167	10	1
10	9 975	213	1318	340212055	167	37	50
24	91075	213	710	334812007	286	29	4
24	91075	213	710	334812007	286	37	7
7	91075	213	1535	330311934	637	37	12
10	91075	213	1445	330711941	597	37	200
10	91075	213	1427	330811942	597	37	8
4	91075	213	1240	330611956	594	37	3
16	91075	213	1030	332711954	439	37	4
24	91075	213	800	334412004	322	13	1
4	91075	213	729	334512005	322	37	350
4	91075	213	729	334512005	322	29	50
24	91275	213	943	322911924	876	40	5
24	91275	213	810	32711917	0	12	3
7	91275	213	745	322711915	878	12	2
24	91375	213	721	330511837	648	29	50
4	91375	213	1302	333911819	381	23	30
4	91375	213	1302	333911819	381	39	80
10	91375	213	850	331411846	569	37	50
24	91375	213	753	330711839	610	37	100
15	92275	215	1312	333111901	411	29	500
15	92475	215	959	334912007	286	37	20
15	92475	215	942	334912007	286	10	1
15	92575	215	801	331811855	529	23	8
15	92575	215	820	331311855	568	3	12
15	92675	215	1218	323511748	863	3	100
15	92675	215	1122	323511758	861	37	300
15	92675	215	1044	323711805	827	29	200
15	92775	215	1020	331211745	582	37	500
15	92775	215	920	325711745	696	23	8
15	92775	215	836	325211745	732	37	150
15	92775	215	647	323511732	866	37	25

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
9	111075	216	1125	334311824	342	39	30
11	111075	216	1350	335711839	232	30	10
7	111075	216	1615	340411903	189	30	20
9	111175	216	1240	335711926	222	29	15
10	111175	216	1530	335312000	252	13	2
11	111275	216	845	340011957	216	29	3
10	111375	216	1030	330311945	635	37	25
10	111375	216	1030	332311945	480	29	10
9	111375	216	950	332211943	480	13	1
10	111375	216	1030	332311945	480	38	20
10	111375	216	1030	332311945	480	16	4
11	111375	216	1720	332511933	482	30	2
9	111375	216	1400	332511955	478	29	12
10	111375	216	1235	332511956	477	29	11
9	111475	216	1420	331611809	538	25	30
10	111475	216	1650	331011821	613	39	8
10	111475	216	1640	331011821	613	25	50
9	111575	216	1250	324511732	800	37	750
15	111675	217	853	334111822	342	25	15
15	111675	217	930	334611828	306	39	4
15	111675	217	930	334611828	306	25	10
11	111675	216	1355	331411749	581	37	500
15	111675	217	1224	333511838	416	25	7
15	111675	217	1224	333511838	416	25	8
15	111675	217	1334	333511853	413	25	5
15	111775	217	1023	335511848	266	25	10
15	111775	217	832	334211854	336	25	1
15	111775	217	1315	335511918	260	25	1
15	111875	217	1107	333511952	401	29	8
15	111975	217	1319	335711855	229	30	5
15	111975	217	1355	325511853	718	16	1
15	111975	217	1030	332711858	450	30	2
15	111975	217	1223	330711855	607	30	3
15	111975	217	1110	331611855	529	30	6
15	111975	217	1315	325711855	682	30	4
15	112075	217	1224	323511752	862	3	12
15	112075	217	650	324811821	758	37	8
15	112175	217	642	323511738	865	37	30
15	112175	217	918	325711745	696	37	3
15	112175	217	923	325711745	696	37	20
15	112175	217	655	323511742	864	37	8
15	112175	217	647	323511742	864	37	6
15	112175	217	910	325711745	696	37	6
3	112175	217	851	325211745	732	37	1200
10	121175	218	1335	331411811	576	30	6
11	121175	218	930	330011740	697	37	30

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
11	121175	218	800	325011728	769	37	750
11	121175	218	1530	332511820	497	23	76
11	121275	218	1020	332611818	458	39	50
11	121275	218	800	332211820	497	23	35
11	121275	218	1020	332611818	458	23	25
11	121375	218	835	332311820	497	39	4
11	121375	218	1330	332211815	498	23	200
11	121375	218	1130	332211818	497	39	20
11	121375	218	1140	332211819	497	23	25
11	121375	218	1415	332111815	498	39	6
11	121475	218	1130	331911826	534	15	1
11	121475	218	1048	331911822	535	23	40
11	121475	218	1045	331911822	535	39	6
15	121575	219	1249	333111901	411	2	2
15	121575	219	741	334111822	342	25	50
11	121575	218	815	331711825	535	23	40
11	121575	218	1100	331911823	535	39	20
11	121575	218	810	331911826	534	23	20
11	121575	218	920	331911823	535	23	400
11	121675	218	910	332011815	537	39	10
11	121675	218	910	332011815	537	38	1
11	121675	218	910	332011815	537	23	50
15	121675	219	1136	335511902	263	30	2
15	121675	219	1233	335511918	260	30	2
11	121675	218	1305	332011815	537	30	8
5	121675	219	1513	335511952	253	30	3
5	121675	219	1349	335511938	256	30	0
15	121675	219	931	335311841	267	15	1
15	121675	219	814	334211854	336	30	10
15	121675	219	730	333711859	373	30	8
11	121675	218	835	332311820	497	23	50
15	121675	219	1032	335511848	266	25	4
11	121775	218	1320	332211813	498	23	40
11	121775	218	1010	332111814	498	30	1
11	121775	218	1145	331911814	537	23	30
11	121775	218	1440	332611815	459	39	20
11	121775	218	1440	332611815	459	23	50
11	121775	218	1400	332111813	498	23	25
11	121775	218	1345	332111813	498	39	50
15	121875	219	1455	322611904	880	30	2
15	121875	219	1400	322711910	879	30	8
15	121875	219	1220	324811902	750	13	1
11	121875	218	1350	331911817	536	23	25
11	121875	218	1350	331911817	536	39	6
11	121875	218	1325	332111817	497	15	5
11	121975	218	1025	331611812	537	39	25

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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
11	121975	218	1025	331611812	537	23	20
15	121975	219	815	325511812	726	30	3
15	121975	219	805	325511812	726	30	2
11	121975	218	1430	330111742	659	30	2
15	121975	219	727	325511808	727	30	3
15	121975	219	856	325211805	728	30	6
15	121975	219	959	324211805	794	30	25
15	121975	219	919	324711805	762	30	1
15	121975	219	909	325211805	728	30	4
11	121975	218	1640	325611734	698	37	7500
11	121975	218	1615	325411739	733	13	1
11	121975	218	1630	325611734	698	30	7
15	122075	219	1110	332211748	503	25	20
15	122075	219	817	324711745	766	30	5
10	02276	223	835	331711828	534	39	21
15	1 576	221	839	334611828	306	25	5
15	1 576	221	800	334111822	342	25	50
23	1 576	220	1000	333111846	414	30	6
23	1 576	220	955	333111846	414	30	20
11	1 576	220	1435	334711930	294	15	3
23	1 576	220	1250	334411916	331	29	225
11	1 576	220	1206	334211909	333	30	12
23	1 576	220	1235	334311912	332	30	1
15	1 576	221	859	334811832	305	15	2
23	1 576	220	1642	335011955	289	29	2
23	1 576	220	1611	335111949	254	15	5
15	1 576	221	1325	333011901	449	15	3
23	1 676	220	1008	334912020	284	29	15
15	1 676	221	1207	335511902	263	15	1
15	1 676	221	1148	335511858	264	15	6
15	1 676	221	825	334211854	336	15	1
15	1 776	221	1332	333311948	402	30	2
15	1 776	221	1629	332511924	484	38	100
11	1 776	220	1200	33181828	0	23	30
23	1 776	220	1213	331[illegible]11827	534	23	15
23	1 776	220	1208	331[illegible]11828	534	39	6
23	1 776	220	1208	331911828	534	23	25
11	1 776	220	1200	331811828	534	39	5
23	1 776	220	1306	331711820	536	15	1
11	1 776	220	1155	332011829	534	23	60
11	1 776	220	1140	332011829	534	23	30
11	1 776	220	1130	332111829	495	15	2
11	1 776	220	1120	332011830	534	23	25
11	1 776	220	1025	332511833	494	15	3
11	1 776	220	1257	331811822	535	23	25
23	1 776	220	1235	331811823	535	23	40

OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
23	1 776	220	1230	331911823	535	23	50
23	1 776	220	1222	331911824	535	23	5
15	1 876	221	1045	325711855	682	30	6
15	1 876	221	1644	322911859	881	30	2
15	1 876	221	1644	322911859	881	37	300
15	1 976	221	1230	323511752	862	30	4
15	1 976	221	1446	323511722	868	25	20
15	1 976	221	1438	323511728	867	39	10
15	1 976	221	1519	323611718	836	15	3
15	1 976	221	1541	323811716	836	15	2
15	1 976	221	1216	323511752	862	15	4
15	1 976	221	1034	324211805	794	29	12
15	1 976	221	1216	323511752	862	21	1
15	1 976	221	948	325211805	728	38	20
15	1 976	221	847	325511812	726	30	6
15	1 976	221	754	325511822	724	29	6
15	11076	221	728	323511722	868	37	5
15	11076	221	738	323511722	868	37	5
15	11076	221	1000	323711745	831	30	12
15	11076	221	1107	325211745	732	15	2
15	11076	221	1502	332611753	463	38	30
15	11076	221	1513	332611753	463	15	2
15	11076	221	1525	332911757	462	15	2
15	11076	221	1603	333311802	423	29	2
24	11976	223	1240	334211822	342	15	3
24	11976	223	1320	334211818	343	15	1
11	11976	223	1015	333611845	376	15	3
11	12076	223	650	332711829	456	23	150
11	12076	223	730	332711829	456	39	30
1	12076	223	815	332911836	454	15	3
11	12076	223	1145	335011914	297	30	5
1	12076	223	1710	341611935	96	15	2
24	12076	223	1530	340811931	159	30	13
10	12076	223	1220	335311918	260	2	2
24	12076	223	1220	335311918	260	30	3
24	12176	223	1610	341011932	159	30	100
11	12176	223	1745	340111927	184	15	5
24	12276	223	1510	324611732	768	37	8
24	12276	223	1645	324311723	802	15	1
1	12276	223	1735	324211721	802	15	1
11	12276	223	1225	325011759	763	30	1
10	12276	223	850	331911824	535	23	300
24	12276	223	755	332111839	493	15	3
10	12276	223	812	331711828	534	23	251
10	12276	223	807	332011829	534	15	3
24	12276	223	723	332311831	494	23	250

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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPECIES	NUMBER
11	12376	223	630	325311717	737	15	2
24	12376	223	800	323211725	868	23	100
24	12376	223	800	323211725	868	39	15
10	12376	223	1631	333011810	460	38	200
10	12376	223	1618	332911811	459	30	3
1	12376	223	1558	332811812	459	30	12
10	12376	223	1050	325511737	733	15	2
24	12376	223	1610	332911811	459	30	3
15	2 976	226	812	334111822	342	23	12
15	21176	226	806	335912018	212	30	6
15	21176	226	909	334912007	286	30	3
15	21176	226	927	334912007	286	29	150
15	21176	226	1630	332911900	450	15	3
15	21176	226	1521	332511904	488	30	10
15	21176	226	1356	332511924	484	38	50
15	21276	226	1200	330211859	644	11	2
15	21376	226	1657	324211835	788	38	20
15	21376	226	1733	324611829	757	30	10
15	21476	226	828	325511818	725	30	4
15	21476	226	951	325211805	728	37	8
15	21476	226	1155	323511758	861	30	2
15	21476	226	756	325511822	724	2	2
15	21576	226	1051	331211745	582	37	25
15	21576	226	845	325211745	732	38	15
10	21776	228	720	333011750	464	15	1
23	21776	228	1355	333011749	464	2	1
23	21776	223	1337	333011749	464	15	2
11	21776	226	745	332711747	464	37	2500
10	21776	228	1240	332711744	465	15	3
23	21876	228	1052	332811752	463	15	2
23	21876	228	1424	332911748	464	15	3
23	21876	228	1517	332311740	505	15	2
11	21876	228	1605	332111734	506	15	1
23	21876	228	1545	332311737	505	15	3
23	21976	228	840	323711715	837	15	1
11	21976	228	1000	323211725	868	37	8
23	21976	228	1137	324711731	768	37	13
11	21976	228	1035	323511726	867	37	3
11	21976	228	1520	325511720	737	15	1
23	21976	228	1310	325311733	734	37	25
11	21976	228	1225	325211733	734	15	2
23	21976	228	1210	325111732	734	15	4
23	21976	228	1205	32511732	0	37	5
11	21976	228	1530	325311720	737	15	2
10	22076	228	1302	332111750	503	30	10
10	22076	228	1216	331911747	542	13	1

TRIPS 200-299 SORTED BY DATE -- 420 RECORDS
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OBS	DATE	TRIP	TIME	LAT/LONG	GRID	SPEC
10	22076	228	905	325011724	770	
23	22076	228	1430	333811802	384	
23	22076	228	1510	334211808	345	
23	22076	228	1530	334211814	344	
23	22076	228	1515	334211811	344	
11	32676	238	845	330411824	651	

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APPENDIX A2
SEABIRDS:

Details of Strip Censusing Techniques

K.T. Briggs and G.L. Hunt, Jr.

APPENDIX III-A2

Details of strip censusing techniques

At the outset of this study we decided to develop both ship and aircraft censusing techniques that would yield "hard" estimates of bird population density at sea. These estimates were to be used to extrapolate to total area abundance figures - one of the most useful types of output for making management decisions. Although there are many censusing techniques available, none are generally accepted by seabird researchers for use in generating population density estimates.

Most of the available techniques yield relative indices of abundance. Outputs from these techniques are in units of birds per linear mile (or km), birds per hour of observation (or other standardized watch period), or birds per station (often stations occupied for oceanographic, benthic, or fisheries sampling). Studies that report indices of this sort are usually based on the assumption that bird abundance at sea is proportional to the number (and species composition) of birds seen out to an unspecified distance from a ship by an experienced observer under variable conditions (c.f. Jehl 1974, Gould 1974, Sanger 1973). There are several reasons to expect real composition and density to differ from those measured by these techniques. The relative conspicuousness of different birds, their behavior, flock size and observation conditions all influence the validity of relative abundance estimators. Differences in observer abilities are clearly a major concern if several studies of this sort are compared. No details are available on the variance or validity of these methods.

A number of authors have used strip censusing procedures at sea, reporting the number of birds per unit area (c.f., Crossin 1974, Wiens and Scott 1975). One of two zonation schemes form the basis of these absolute density estimators:

1) the investigator estimates for each taxon the range in which reliable censusing is likely, counting all birds regardless of "effective range". Counts are then divided by area transected in the effective range of each taxon to yield density; or,

2) the investigator estimates a single effective range for all taxa combined (assuming that even the least conspicuous ones are reliably censused in this range), counts birds only within that range, and applies a single range conversion factor to all counts to yield density.

Strip censuses (absolute density estimation) are superior to relative abundance counts when one desires to discuss species composition on an absolute basis. Strip counts are limited in their accuracy by observer variables, conspicuousness and flocking variables, and habitat screening. In addition, strip counts are subject to errors in distance estimation (not a problem in relative abundance methods). No details are available on variance and reliability of strip censuses of seabirds.

Emlen (1971) discussed the merits of several transect techniques and proposed a new censusing method to overcome some of the difficulties of the extant ones. His discussion did not specifically address the problem of at-sea censusing, but he identified major categories of variables that affect the validity of the different techniques. We analyzed our censusing methods using Emlen's scheme of classification. The results of that evaluation follow.

We chose a strip censusing method for sampling seabirds in southern California. This decision reflected the need for broad, systematic sampling (quadrat and random track approaches were unsuitable), the necessity to discriminate between groups of birds that differed in behavior, plumage and size, and the need to establish "hard" density estimates (to be extrapolated via computer to population abundance estimates). A further advantage of the strip technique is that, when used in company with a distance-zonation scheme, the investigator can assess environmental, observer, and conspicuousness variables before assigning conversion factors to various species groups. Thus, the actual sighting data can be used to define the limits of effective censusing, and the need for intuitive or arbitrary decisions is eliminated.

We counted all birds that we encountered, noting in which of four distance zones (from observer) each sighting occurred (0-50, 50-150, 150-400, and beyond 400m) and also recorded whether birds were flying, diving or swimming, their direction of travel, and whether birds were obviously approaching or avoiding the observer. Airborne observers concentrated on the innermost (0-50m) zone, but otherwise recorded data in the same format employed on board ship.

We tried to either eliminate or evaluate four kinds of variables in order to improve the validity of our methods as estimators of bird density. These variables included observer differences, habitat screening, conspicuousness and bird behavior relative to the observer, and distance measurement. These are discussed in order, first for surface, then air observations.

Surface censuses

1) Observer variables: Experience, identification and counting abilities, and fatigue all combine to influence the data collection efforts of different observers. In shipboard censusing we used experienced observers exclusively (ranging from 5 to 10 years of experience among three primary observers). Additionally, all records for the standard cruises conducted in 1975-76 were made by a single observer. These restrictions reduced the effect of observer bias on the results of shipboard observations.

Fatigue was a function of the number of hours of surveying in a given day, the weather and glare conditions through the day, and whether assistance (recorder or alternate observers) was available to the primary observer. Fatigue (rated 0-5 by the observer) was compared with glare factors (discussed below) to yield a subjective rating of confidence in censusing accuracy. When confidence was low, we used counts as indicators of gross species composition only.

2) Habitat screening: Five factors directly influenced the screening effect of the environment. These were the height and direction of progress of seas and swell relative to the ship, observer height, glare, fog, and the presence of whitecaps. Observer height varied from 3.3 to 8m ASL (usually 8m). Sea state, wave height and direction, whitecaps, and the presence of fog were recorded periodically (at least twice per hour). When observation conditions deteriorated significantly (to the point where observers felt that the outermost (150-400m) zone was not being censused efficiently), we restricted observations laterally (thus requiring a different area conversion factor during data analysis) or ceased observations altogether.

Glare was estimated as a percentage of a 270° field of vision; these records were later converted to a computer code of 1-6 (20% increments from 0% to 100%). When glare was so great that censuses were of doubtful accuracy (>40% obscured), observers either restricted their counts to zones that were clear of glare, or ceased counting altogether. Small, inconspicuous birds and those that habitually sit on or fly close to the surface were the ones most likely to be hidden by the habitat. Gulls, pelicans and other species that were typically seen on the wing were less subject to habitat screening.

3) Conspicuousness and behavior: The relative conspicuousness of different types of birds is primarily a function of size, plumage characteristics, behavior, and flocking tendency. Small, dark birds that swim and dive and that seldom flock together were the most difficult targets to see and identify. Larger, brightly-plumed birds that often flock and are typically seen flying are the most easily censused targets. Further, birds that actively avoid the ship (observer) by diving or moving away are less easily censused than ones that approach or ignore the observer. The interaction of these variables (size, color, flocking, approach/avoidance) determines the effective sighting range for a species under a given set of observation conditions.

In order to establish range conversion factors appropriate to the typical behavior and conspicuousness of each group of bird species, we tested the distribution of sightings against distance from observer (0-50, 50-150, 150-400m) under good or excellent conditions. Our criterion for establishing effective sighting range was the maximum distance at which we were confident that individual birds of a given species could be reliably censused. We used all sightings recorded on

standard transect cruises by a single observer (D.B. Lewis), limited the tests to sightings of single birds (since flocks are more conspicuous), and divided behavior into categories of flying or swimming. Table III-A2-15.3 presents frequency distributions (for sightings of the sort just described) by distance and behavior. We tested observed frequencies against an expected distribution corresponding to the area in the three zones (chi-square goodness-of-fit-test). (An "ideal" bird ignores the ship and is randomly distributed with distance. The distribution of sightings of "ideal" birds with distance is therefore proportional to the relative area encompassed in each sighting zone.) The distributions of sightings of 15 species were significantly skewed toward the inner (0-50, 50-150m) zones. Of these, the three alcids were rated as obvious avoiders of the ship (they should have been seen more frequently in the outer zones). We concluded that these three alcid species (in which distribution of sightings conflicted with tendency to avoid) were not reliably censused beyond 150m.

A second group of eight species that warranted further attention was that in which our rating of "approach/avoid" was either neutral or unknown, and the distribution of sightings of individual birds was skewed toward the inner zone. With these species we compared the ratio of sightings of singles versus flocks in the three zones. This ratio is constant, or relatively so, in all three zones when the outer zone is within the effective sighting range of a species. If, on the other hand, sightings of single birds drop off with distance, and most distant sightings are of flocks, then we can conclude that singles are not reliably censused in the outer zone (criterion for a smaller effective range). The data indicate that five species (three storm-petrels, two

Table III-A2-153. Distribution of sightings of single individuals of some southern California seabirds as a function of distance from observer. All data were taken from ship by a single observer. Sightings were separated into categories of flying and swimming. The tendency of each species to approach or avoid is also indicated in parentheses. Distributions that deviated significantly from expected (corresponding to distribution of area in zones) at the $\alpha = .05$ level (by chi-square-test-of-goodness-of-fit, df = 2) are followed by an asterisk. The expected proportions of total sightings by zone were: 0.125 (0-50 m), 0.250 (50-150 m), and 0.625 (150-400 m).

Species	Behavior	Number of sightings	Percent of sightings by distance 0-50m	50-150m	150-400m
Loon, Arctic (Neutral-Avoid)	fly	69	13.0	29.0	58.0
	swim	5	0.0	20.0	80.0
Fulmar, Northern (Approach)	fly	108	17.6	38.0	43.5*
	swim	30	40.0	43.3	16.7*
Shearwater, Pink-footed (Approach)	fly	101	8.9	41.6	49.5*
	swim	29	55.2	34.5	10.3*
Shearwater, Sooty (Neutral)	fly	191	16.2	25.7	58.1
	swim	22	13.6	27.3	59.1
Storm-Petrel, Ashy (Neutral?)	fly	11	9.1	63.6	27.3*
Storm-Petrel, Black (Neutral?)	fly	62	9.7	40.3	50.0*
Storm-Petrel, Leach's (Neutral?)	fly	72	33.3	36.1	30.6*
Storm-Petrel, all three (Neutral?)	swim	21	33.3	66.7	0.0*

Table III-A2-153 (Continued)

Species	Behavior	Number of sightings	Percent of sightings by distance 0-50m	50-150m	150-400m
Pelican, Brown (Neutral)	fly	115	12.2	28.7	59.1
	swim	62	12.9	27.4	59.7
Cormorant, Brandt's (Neutral)	fly	40	12.5	30.0	57.5
	swim	18	16.7	33.3	50.0
Phalaropes, Red and Northern (Neutral)	fly	22	40.9	40.9	18.2*
	swim	14	21.4	78.6	0.0*
Jaeger, Pomarine (Neutral)	fly	107	19.6	40.2	40.2
	swim	37	40.2	46.0	10.8*
Gull, Western (Approach)	fly	402	21.9	45.0	33.1*
	swim	159	34.6	36.5	28.9*
Gull, California (Approach)	fly	182	29.7	29.6	30.8*
	swim	55	52.7	32.7	14.6*
Gull, Bonaparte's (Neutral)	fly	54	22.2	37.0	40.7*
	swim	18	55.6	22.2	22.2*
Kittiwake, Black-legged (Neutral-Approach)	fly	189	11.1	23.3	66.1
	swim	35	28.6	42.9	28.6*
Murre, Common (Avoid)	fly	6	33.3	33.3	33.3*
	swim	10	30.0	60.0	10.0*
Auklet, Rhinoceros (Avoid)	fly	25	8.0	36.0	56.0*
	swim	57	45.6	40.4	14.0*
Auklet, Cassin's (Avoid)	fly	23	13.0	30.4	56.5*
	swim	47	59.6	29.8	10.6*

phalaropes) are not reliably censused in the 150-400m zone (Table III-A2-154).

Taken together, these data indicate that storm-petrels, phalaropes, and alcids were reliably censused only as far as 150m from the ship. Though we lacked sufficient data to test sightings of small grebes against distance, we grouped them with the other small birds in the 0-150m category.

4) Range estimation: Of critical concern, of course, is accurate distance estimation at sea. We used a split-image rangefinder and radar observation on nearby targets to check our distance estimates. We agree with Emlen (1971) that the experienced observer can estimate distances with considerable accuracy (to $\pm$ 10%) out to several hundred meters. Errors in our distance estimates, and thus in density calculations, are probably not a serious source of bias.

On the basis of the information discussed above, two conversion factors were used to relate the number of bird sightings and effective sighting range to yield density. One factor was applied to all conspicuous birds, the other to inconspicuous ones (small grebes, storm-petrels, phalaropes, all alcids). Ship's transect segments were of 7.41 km length (4NM) and the effective search corridors were 150m and 400m to each side of the ship (300m and 800m total corridor widths). Density was calculated as follows:

$$\frac{\#\ \text{sightings per segment}}{\text{conversion factor}} = \text{sightings/unit area}$$

where: conversion factor [conspicuous] = 7.41 km x 0.8 km = 5.93 km^2

and conversion factor [inconspicuous] = 7.41 km x 0.3 km = 2.22 km^2

III-A2-154. Distribution of sightings of single individuals and flocks with distance for eight species of southern California seabirds. Expected singles/flocks ratio is derived by adding sightings from 0-50m and 50-150m zones (assuming that all single birds and all flocks are reliably censused in the inner two zones). Asterisk following rows indicates that distribution of ratios with distances differs from expected at α = .05 level (by one-tailed chi-square test, df = 2).

	No. of Sightings (singles, flocks)	Average No. of Birds in Flocks	Singles/Flocks Ratio by Distance Zones			Expected Singles, Flocks Ratio
			0-50m	50-150m	150-400m	
Storm-Petrel, Ashy	(17, 10)	5.22	2.00	2.75	1.00	2.60
Storm-Petrel, Black	(72, 26)	8.54	3.50	3.63	2.75	3.60 *
Storm-Petrel, Leach's	(78, 22)	5.02	6.50	5.60	1.85	6.00 *
Phalaropes, Red and Northern (combined)	(36, 97)	13.95	0.60	0.35	0.20	0.42 *
Jaeger, Pomarine	(144, 18)	2.38	8.96	7.50	7.84	8.00
Gull, Bonaparte's	(72, 74)	6.40	0.88	1.14	0.93	1.00
Kittiwake, Black-legged	(224, 142)	4.30	1.55	1.60	1.61	1.59

Air surveys

1) Observer variables: There is a learning period through which any observer must pass before he or she attains proficiency at censusing from the air. We employed three observers in the course of eight flight series in 1975-76. One, K.T. Briggs, had participated in similar surveys in Alaska (approximately 60 hours of censusing) and was primary observer for all flights in southern California. Other observers spent considerable time in the air before they carried out transect counts independently. We did not conduct tests in 1975-76 to determine the magnitude of observer differences in transect counts.

Fatigue can dramatically alter the ability of an observer to detect birds from the air. Transect lines were 111 to 222 km long, and required up to 1.3 hours of observation per line. Two observers alternated censusing complete transect lines, enabling the off-duty person to rest. In two cases, we traded watches prematurely due to fatigue. We do not feel fatigue was a serious source of error in censusing from the air.

2) Habitat screening: Only glare and the number of whitecaps present create significant problems for airborne observers. Small birds were difficult to detect when whitecapping was more than moderate (surface winds of more than 45 km/hr). We abandoned censusing when the presence of whitecaps seriously impaired our accuracy.

Glare can be a serious source of bias in counts from the air. On 12 February 1976, we compared the results of counts made with and without glare along three 18.5 km-long lines. The three transects were arranged on east-west axes and were separated by a total of 3.7 km. The flight direction and line flown on each pass were selected

at random. A single observer (Briggs) made all counts. Glare obscured 25-45% of the censusing field when the plane flew east, and none of the field when headed west. All counts were made within a 2½-hour period. The mean number of sightings per transect with glare (7 transects) was 2.43 $\pm$ 1.62 ($\pm s^2$) while the mean number of sightings on eight transects without glare was 6.00 $\pm$ 5.21. Counts made with glare were significantly smaller than those made without (one-tailed t-test, df=13, $p < 0.05$).

The results of these comparisons reinforced our protocol that all transect counts were to be made on the shaded side of the aircraft. If conditions changed in the course of a single census, observers sitting on opposite sides of the aircraft switched jobs in order to maintain glare-free conditions.

3) Behavior and conspicuousness: It is clear that some birds "startle" when approached closely by aircraft. They seldom have sufficient time to avoid detection, however, due to high relative aircraft speed. Alcids, loons, grebes, and shearwaters may either dive or take off, but both forms of avoidance actually increased the conspicuousness of those species to aerial observers (in contrast to the situation on a ship); splashing on the surface calls the observer's attention to the presence of the "avoider".

Gulls, terns and jaegers often flew to the side when approached in flight, but about as many birds veered onto the transect line as veered off. Pelicans and tubenoses (procellariforms) other than shearwaters seemed not to react to the approach of the aircraft to a great degree. In short, while some birds moved off the transect path, others moved onto it (presumably balancing losses), and diving birds made themselves more noticeable by avoidance behavior. Aerial counts were probably not seriously affected by overt avoidance by birds.

Small birds, especially darkly feathered alcids and storm-petrels, are the most difficult targets to detect from the air. We chose a transect width (50m) that took in the effective censusing range of even the most inconspicuous birds. In doing so we sacrificed potential information about large, conspicuous birds at greater sighting distances but achieved the most accurate possible estimates of absolute density and species composition.

4) Distance estimation and conversion factors: We estimated the limits of the 50m transect strip by calculating sighting angles from the vertical. Flight altitudes varied between about 45 and 75m ASL; we compensated by adjusting our sighting angles. Sighting angles were checked with an inclinometer and marks drawn on the inside of the aircraft's cabin. We probably attained ±10m accuracy in estimating transect width at any given time, but errors of this sort averaged out over a 1 to 3 km distance with fluctuations in altitude.

We used a single conversion factor to relate sightings of all taxa to area of coverage. This reflected our decision to limit observations to the effective sighting range of the most inconspicuous targets. (Use of a larger search area, as would be possible for gulls, pelicans, and other large birds would have meant missing many small birds close to the flight path because of the large relative search area and very short time period available in which to detect, count, and identify targets [about 2 sec.]).

Bird density within each 18.52 km (10NM) segment was calculated as follows:

$$\frac{\text{\# sightings per segment}}{\text{conversion factor}} = \text{sightings/unit area}$$

where conversion factor = 18.52 km x 0.05 km = 0.93 km^2.

Analysis of reliability of transect methods

This section presents the results of field studies designed to estimate the temporal and spatial variance of surface and aerial sampling techniques used in 1975-76 baseline studies of southern California seabirds. We examined three aspects of aerial and shipboard strip transect reliability: 1) variance of replicate counts along a given transect; 2) the effect of distance and time displacement on similarity of counts; and 3) the replicability of species composition estimates among replicate samples. We also present a comparison of aerial and surface strip transect techniques as estimators of avian density and species composition. Throughout this analysis,"replicate" counts are ones made by the same observer under relatively constant observation conditions.

Results:

1) Variance of immediate replicate density estimates

a) Aerial censuses

We carried out from two to six replicate counts at sea over transect lines of varying lengths, seeking to determine the variance characteristic of density estimates. Replicate counts were made under relatively constant environmental conditions and in as small a time frame as possible. We calculated the Coefficient of Variation ($V = \frac{s}{\bar{x}} \times 100$) among replicate aerial counts made on 23 January and 12 February, 1976 (Table III-A2-155).Each of four transect lines, 14.52 to 27.75 km in length, was censused twice on 23 January. The extreme values of V were 7.5% and 47.1%. We counted the birds on one 18.5 km long line four times on 12 February within 2.3 hours. The value of V for the four counts was 46.2%.

III-A2-155. Comparison of variance and coefficient of variation between immediate replications aerial censuses. Observations were made by the same individual.

Date	Length of Transect (km)	Number of Replications	Time (hrs) between Replications	$\bar{x}$ sightings/transect $\pm s^2$	Coefficient of Variation (V)
23 January 1976	27.75	2	0.2	9.5 ± 0.5	7.5%
	27.75	2	0.6	9.5 ± 5.0	23.5%
12 February 1976	18.52	2	0.6	6.3 ± 0.5	11.2%
	18.52	2	1.5	7.5 ± 12.5	47.1%
	18.52	4	2.3	7.5 ± 12.0	46.2%

b) Shipboard censuses

Birds were censused six times from shipboard along a single 11.1 km transect on 12 February 1976. The values of V for the six censuses were 13.9% and 10.8% when calculated from a 300 m and an 800 m search corridor respectively. The six counts spanned a total of 4.5 hours.

Thus, for replicate counts, less variability was found in shipboard censuses than in aerial censuses. The fact that the use of the wider of the two ship corridors yielded a lower coefficient of variability suggests that the reason for the lower variability of shipboard censuses, as compared with aerial censuses, was the wider corridor width.

2) Effect of temporal separation on density estimates

a) Aerial censuses

We ran replicate counts on selected lines on 24 January 1976 at time intervals varying from 4.5 to 5.1 hours (Table III-A2-156).Values of V were similar to those obtained from multiple immediate replicates (Table III-A2-3). We were not able to obtain replicated counts with delays greater than 5.1 hours due to changing conditions of observation.

b) Shipboard censuses

We replicated counts on several lines on 12 and 13 February 1976 with delays of 6.5 to 24 hours between counts. Table III-A2-156 shows that the similarity of the replicated counts decreased as the interval between counts increased. When counts were separated by 24 hours, V varied from 26.8% to 95.8%. Thus, while counts made within the same day were similar in variability to immediately replicated censuses (Table III-A2-155 counts taken 24 hours apart reflected apparent small-scale shifts in bird distribution.

III-A2-156. Effect of time delays on Variance and Coefficient of Variation among replicate censuses of seabirds. Observation conditions were relatively constant. Within each set of replicates, observations were made by the same individual.

Date	Length of Transect (km)	Number of Replications	Time Delay (hrs)	$\bar{x}$ sightings/transect ± s^2	Coefficient of Variation (V)
Aerial Counts					
24 Janaury 1976	18.52	2	4.5	3.5 ± 0.5	20.2%
	18.52	2	4.8	4.5 ± 0.5	15.7%
	18.52	2	5.0	3.5 ± 0.5	20.2%
	18.52	2	5.1	10.0 ± 0.0	0.0%
Shipboard Counts					
12 February 1976	7.4	2	6.5	12.5 ± 5.0	17.9%
	7.4	2	7.5	7.5 ± 12.6	47.3%
	7.4	2	8.5	12.5 ± 11.6	27.3%
	7.4	2	9.3	14.5 ± 25.6	34.9%
12-13 February 1976	7.4	2	23.9	15.0 ± 128.0	75.4%
	7.4	2	23.9	18.5 ± 24.5	26.8%
	7.4	2	24.0	15.5 ± 220.5	95.8%
	7.4	2	23.9	17.0 ± 18.0	25.0%

3) Effect of geographic separation on density estimates

a) Aerial

The degree to which aerial counts made in a restricted time frame on one transect are similar to those made on an adjacent and parallel transect in the same time frame was examined on 12 February 1976. Replicate counts on two lines separated by 3.7 km (three and four counts, respectively) were not significantly different ($F_{2,3} = 1.6$, $P > 0.05$; Student's $t = 1.23$, $df = 5$, $0.2 > P > 0.4$). We have not tested similarity of aerial transect data over wider geographic displacements in the same time frame.

b) Shipboard

Two types of evidence relate to similarity of transect counts made from ships on geographically separated lines. On 12 February, 1976, we found that the mean number of sightings on two parallel lines separated by 1.85 km (each was 11.1 km long) was almost identical (16.5 sightings per count from six counts of line A compared with 16.0 from two counts of line B). Variances were also similar.

To determine the nature of variance between counts on adjacent transect segments (from our "standard" transect track) within a given 10' bloc of latitude and longitude, we selected at random four 10' blocs, each containing two, 7.4 km long transect segments and calculated $\overline{x}$, s^2 and V for each pair of counts from each of four cruises: July, August, September, and November, 1975. Coefficients of Variation ranged from 10% to 100%; the mean value of V from all 16 pairwise comparisons was 39.6%. This mean value is somewhat higher than V from six counts on a single line (12 February 1976, above), but indicates the general similarity of density estimates from adjacent segments selected from transect data generated in 1975-76.

4) Replicability of species composition estimates

We have not made sufficient progress in the analysis of species composition estimation procedures to present a statistical treatment. However, some general comments are possible. We calculated composition by major taxonomic groups from the replicated aerial and shipboard counts made on 12 February 1976 in the same area.

a) Aerial counts

Table III-A2-157 shows Rhinoceros and Cassin's Auklets contributed a large and variable proportion of the aerial counts, as did the various gulls (Western, Herring and Black-legged Kittiwake).

b) Shipboard counts

In contrast to the aerial censuses, Table III-A2-157 shows that gulls dominated shipboard counts, while auklets contributed variable and smaller percentages of the totals. Gulls were more dominant numerically, and their contribution to overall bird density was less variable on shipboard than on aerial censuses.

These comparisons are crude, however, and cannot be tested statistically. The counts spanned several hours, and it is reasonable to assume that species composition would vary along a given transect over that period of time. Nevertheless it appears that repetitive sampling in one area from both ship and aircraft yielded reasonably consistent composition figures; aerial data appeared to vary somewhat more than those from the ship.

5) Comparison of simultaneous surface and air censuses

On 16 December 1975 and 12 February 1976, we conducted simultaneous ship and aircraft censuses along the same transect lines. The December operation took in a single east-west line, 37 km in length, along 33°55'N

3) Effect of geographic separation on density estimates

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III-A2-157. Variability of species composition estimates (in %) among replicate ship and aerial censuses in a relatively restricted time frame. The transect lengths were 11.1 km for ship censuses and 18.5 km for aerial. All counts were made on 12 February 1976.

Time	Total no. of sightings	Percent Composition by Species: Common Loon	Northern Fulmar	Brown Pelican	Red Phalarope	Pomarine Jaeger	Gull spp.	Auklet spp.
Ship Transects								
1024	27	7.4	0	3.7	0	7.4	63.0	14.8
1100	19	0	0	0	0	15.8	63.2	21.1
1220	19	0	0	0	0	0	89.5	10.5
1253	14	0	0	0	0	7.1	92.9	0
1416	16	0	6.3	0	0	0	87.5	6.3
1451	23	0	0	0	8.7	4.3	73.9	13.0
Aerial Transects								
1038	16	0	6.3	0	0	0	25.0	68.8
1054	14	0	7.1	7.1	0	7.1	50.0	28.6
1155	5	0	20.0	0	0	0	40.0	40.0
1250	8	0	0	0	0	12.5	75.0	12.5

latitude from near Anacapa Is. to the Santa Cruz Channel. On 12 February, a single line, 18.5 km in length, was censused repetitively. The latter census are was centered 21 km west of San Clemente Is. Table III-A2-158 gives the density figures for ship and aircraft counts from December and February. Density estimates for two ship's corridor widths, 300 m and 800 m (150 m and 400 m to each side), are presented. Ship density estimates for the transect were lower from both 300 and 800 m corridors than air estimates.

On 12 February, a single shipboard observer made six counts along one transect line in 4.5 hours; an airborne observer counted birds along the same line four times in 2.3 hours. Total density estimates calculated from surface data (800 m corridor) were considerably lower than from the aerial data; density estimates were more similar when only the data from the inner 300 m ship's corridor was compared with aerial data.

The results of these comparisons are of considerable interest. Aerial transect data yielded higher estimates of total density that did surface data. Apparently, the inclusion of the outer portions of the search corridor (150-400 m laterally) on ship transects added relatively few sightings and resulted in deflated estmates of density (though less variance among replicate counts). The apparent under-representation of small alcids (birds that are inconspicuous and actively avoid a ship) on ship transects, even in the zones close to the observer (0-150 m laterally), accounts for some of the differences between surface and aerial density estimates. We suspect that: 1) impaired visibility under the bow of the ship or behind swells (hiding small, swimming birds); 2) the relatively large area that must be scanned from the ship; and 3) the tendency of gulls to follow ships, may all contribute to

III-A2-158. Comparison of estimates of bird density during simultaneous ship and aerial censuses on 16 December 1975 and 12 February 1976. Two transect widths, 300 m and 800 m (150 and 400 m, respectively, to each side) are analyzed for each ship count.

	Ship		Aerial
16 December 1975			
Number of Censuses	1		1
Transect Length	37.0 km		37.0 km
Transect Width	0.30 km	0.80 km	0.05 km
Density of Sightings/km^2	1.80	0.94	2.71
Density of Individuals/km^2	2.52	2.09	3.76
12 February 1976			
Number of Censuses	6		4
Transect Length	11.1 km[a]		18.5 km[a]
Transect Width	0.30 km	0.80 km	0.05 km
Density of Sightings($\bar{x}+s^2$)/km^2	3.58±0.40	1.86±0.03	7.80±14.16
Density of Individuals($\bar{x}+s^2$)/km^2	12.11±183	5.19±26.52	23.68±285

[a] Aerial transect extended beyond ends of ship transect; both were centered at the same point.

underestimation of density and to biased estimates of species composition by the surface observer. We also feel that use of two rather than one observer on board ship will certainly increase density estimates, since some proportion of birds within the ship transect corridor are invariably missed by a single spotter.

Overview:

It seems probably that aerial transect data were more accurate than surface transect data in assessing avian density at sea. Density of small, inconspicuous birds may have been underestimated by the strip census technique we employed on board ship. The overall higher variance of density obtained by our aerial censuses probably related to the narrowness of the corridor we searched (only 1/16 of the total search corridor of ship transects).

The two methods were roughly similar in accuracy for reflecting density over time and between adjacent tracks. Time delays up to six hours did not adversely affect replicability of aerial counts, though even immediate repetitions produced values of V of 7.5% to 47.1%. Immediate recounts from a ship yielded lower values of V than obtained from the air, although time delays between ship counts adversely affected the similarity of the counts. Results of the geographic displacement studies indicated that both aerial and ship transect data are representative of the waters at least 3.7 and 7.4 km, respectively, on either side of a transect line.

Our work has also shown that density estimates may vary considerably from day to day. This variability in temporally separated counts almost certainly represents small-scale changes in the distribution of the birds.

At this time, it is our impression that both methods produce data records that characterize the actual scale of geographic patchiness of bird concentrations at sea. Certain regions have produced consistently high and other consistently low density figures over a span of several months, regardless of which survey method was used.

Both methods have strengths and weaknesses, and the two complement each other. Aerial censuses can give a very wide coverage in a short period of time, with relatively unbiased estimates of density and relative abundance of species groups. However, aerial censuses are sensitive to small-scale variations in bird populations due to the narrowness of the corridor searched. In addition, species identification is less accurate on aerial censuses. In contrast, shipboard surveys are slow, can cover only a fraction of the area covered by the plane during a survey, and may provide somewhat biased density estimates. However, due to the wider corridor searched, the ship provides results which are less variable than those obtained from the plane (Table III-A2-158, and thus shipboard censuses are less subject to distortion of data by small-scale anomalies in distribution. Also, species identification, of critical importance when dealing with rare or unusual species, is more accurate from the ship.

The comparisons presented above were obtained under nearly ideal observations conditions and moderate bird densities. It is clear that more work of this sort is needed, especially under a variety of observation conditions and with both high and low avian densities.

APPENDIX A3
SEABIRDS:

Historical Data on Channel Island Breeding Colonies

H.L. Jones

APPENDIX III-A3

Historical data on Channel Islands breeding colonies

Unfortunately, most of the historical data on seabird colonies in southern California has never been published, but much useful information is contained on museum egg set data slips and in the unpublished field notes of the many oologists and museum collectors who visited the islands in the latter part of the nineteenth and early twentieth centuries. Most of these unpublished field notes, data cards, and egg sets are housed in the Western Foundation of Vertebrate Zoology (hereafter referred to as WFVZ). Other museums visited by us which contain useful information are as follows: California Academy of Sciences Museum (CAS); Denver Museum (DM); Los Angeles County Museum of Natural History (LACM); Museum of Vertebrate Zoology, Berkeley (MVZ); San Bernardino County Museum (SBCM); San Diego Natural History Museum (SDM); Santa Barbara Museum of Natural History (SBM); Stanford University (SU) [collection presently at CAS]; University of California at Los Angeles (UCLA) [Dickey Collection].

It is extremely difficult to establish the total number of egg sets taken from a given colony in any particular year for several reasons. Many egg sets are no longer extant, and others are undoubtedly buried in as yet uncatalogued egg collections. In many cases, two or more collectors accompanied each other on expeditions to the islands and reported independently on the number of egg sets taken. Often it is unclear from the

notes whether the collector is referring to all the egg sets taken by the party or just those he took himself. Lloyd F. Kiff, curator of WFVZ, has generously supplied us with his compilation, as of May 1976, of egg sets taken on the Channel Islands so that we might include this information here. He is currently preparing a detailed manuscript on the subject (in prep.).

Another problem involves previous estimates of colony size and extent. In most cases, investigators have made no mention of the techniques used in making their estimates, nor have they indicated how thorough a search was made for nesting birds, particularly for burrow nesters. We have made no attempt to evaluate their findings, but present them as given in their notes or publications.

San Miguel Island

This island complex has been visited at least 23 times during the breeding season through 1968 and almost annually since then. Information on seabirds is available for 19 seasons prior to 1975. For most visits the only recorded information comes from the data sheets or labels of egg sets and speciments. Some additional information is available for other years, and more or less complete species accounts are available for 1910 (Willet 1912), 1912 (Wright and Snyder 1913), 1939 (Sumner 1939), 1965 (Craig and Sheppard unpubl. notes), and 1968 (Huber 1968).

Ashy Storm-Petrels (Oceanodroma homochroa) were reported by H.W. Henshaw to be breeding in great numbers around 1875 (Willet 1912). Willet, however, could not find any in June 1910, but concedes he may have overlooked them. Most other investigators have found the species

breeding on Castle Rk. and Prince Is., but their estimates of numbers, while varying considerably, suggest that the species no longer breeds in "great numbers". Four specimens (LACM 20563-20566) were collected on Prince Is. in July 1950, and four more (SDM 30306-30308; LACM 66099) were collected there on 26 July 1961. In early July 1965, a banding party consisting of A. Craig and J. Sheppard (unpubl. notes) found them breeding on Castle Rk. and Prince Is., banded three birds and estimated ca. 400 pairs to be present on Prince Is. (it should be noted that many of their estimates of breeding seabird numbers are considerably higher than those of Huber in 1968). Huber (1968) estimated 50-100 birds to be breeding on Castle Rk. and Prince Is. combined. Craig and Sheppard collected 17 specimens and found a nest burrow containing an egg on Castle Rk.

Brown Pelicans (Pelecanus occidentalis) were first recorded by Streator (1888) in July 1886. Five nests were found on Prince Is. on 15 July 1910 (Willet 1910). Two sets of eggs were collected by B.W. Evermann on Prince Is. on 19 May 1919 (CAS 1308, 1318): one set each was taken by J.S. Rowley here on 3 June 1928 (WFVZ 26121), by L.T. Stevens on 25 May 1929 (SBM uncat.) and by Stevens on 24 March 1930 (SBM uncat.). DeGroot's field notes (in WFVZ) for 31 March 1926 mention a large colony of pelicans on Prince Is. at that time. Sumner (1939) reported approximately 200 nests on Prince Is. on 18 April 1939, but none have been reported nesting here since.

Apparently the Double-crested Cormorant (Phalacrocorax auritus) was formerly as common as Brandt's Cormorant here, although it is now vastly outnumbered by Brandt's. Streator (1888) saw Double-crested Cormorants at San Miguel Is. in July 1886. Appleton (unpubl. notes in

WFVZ) in 1905 and 1906 and Willet (1910) in 1910 observed a large colony on Prince Is., and each collected a few egg sets, but Wright and Snyder (1913) either did not encounter the species there in July 1912 or failed to report it. Evermann collected several sets of eggs on 19 May 1919 (CAS 1319-1330); Stevens collected two sets on 25 May 1929 (SBM uncat.), and W.J. Sheffler collected four egg sets there on 11 June 1933 (WFVZ 65933-65936). Sumner (1939) estimated 200 birds building nests on 18 April 1939. Craig and Sheppard (unpubl. notes) estimated about 350 pairs present on 3-5 July 1965. Huber (1968) counted 27 nests on Prince Is., Castle Rk. and the main island of San Miguel on 14 and 15 May 1968.

Large numbers of Brandt's Cormorants (Phalacrocorax penicillatus) were remarked by most early investigators at San Miguel Is., primarily on Prince Is., but few attempted to make any estimates of numbers. Streator (1888) commented on the "mass of living gulls and cormorants" on Gull [=Prince] Is. which "nearly obscured the sun from view when in the air". Appleton's notes state that about 100 pairs were nesting there on 5 and 6 June 1906, and he took 20 to 25 sets of eggs. Willet (1910) states that Brandt's were the most abundant of the cormorants on Prince Is. on 15 June 1910. He also found several large colonies on San Miguel Is. proper. Snyder (unpubl. notes in WFVZ) found 500 nests on Prince Is. on 12 July 1912 and collected one set of eggs. Evermann collected three sets there on 19 May 1919 (CAS 1327-1329); Peyton collected another set on 2 June 1928 (MVZ 4569), and Stevens (unpubl. notes in WFVZ) estimated several thousand pairs on Prince Is. from which he collected one egg set on 25 May 1929 (SBM). In 1933, Sheffler collected

two egg sets on 11 June (WFVZ 65937 and 65938). Sumner (1939) estimated at least 1,000 birds building nests and incubating eggs on 18 April 1939. Craig and Sheppard (unpubl. notes) estimated 1,500 pairs on Prince Is. on 3-5 July 1965. In May and June 1968, the Smithsonian Institution's Pacific Ocean Biological Survey Program (P.O.B.S.P.) personnel (Huber 1968) estimated 1,500 pairs on Castle Rk. and another 2,500 pairs on Prince Is.

Pelagic Cormorants (Phalacrocorax pelagicus) were found by most early investigators at San Miguel Is., though again, few mentioned the numbers of birds present. Appleton (unpubl. notes) found 12 nests on "sea cliffs, away from other Cormorant spp." and collected three sets of eggs on 6 June 1906 (one set of which is now WFVZ 65939). Willet (1910) commented that they were "breeding commonly on the cliffs everywhere" at San Miguel Is. in June 1910. His party took one set of eggs each on 11 and 14 June (WFVZ uncat.). Wright and Snyder (1913), however, made no mention of it here when they visited on 11-13 July 1912. Pemberton (unpubl. notes in WFVZ) saw several pairs and took one egg set on 3 June 1928. Sheffler also took one set on 11 June 1933 (WFVZ 2919). Sumner (1939) observed about 50 individuals on Prince Is. in mid-April 1939, but breeding activities were just beginning at that time. Craig and Sheppard (unpubl. notes) observed 250 pairs on Prince Is. on 3-5 July 1965. In 1968 the P.O.B.S.P. (Huber 1968) counted five nests on Prince Is., 25 nests on Castle Rk. and 100 nests on the main island.

Western Gull (Larus occidentalis) numbers and breeding localities have been poorly documented on this as well as on other Channel Islands. Willet (1910) states they were "breeding commonly on all outlying rocks and islets" of the northern islands, and Howell (1917) calls them

"abundant residents, breeding on all islands...". Streator (1888) found large numbers there in 1886. H.S. Hedrick collected a set of eggs on Prince Is. on 5 June 1905 (Peyton unpubl. notes in WFVZ). Appleton (unpubl. notes) found 80-100 pairs, but few actual nests on 6 June 1906. He collected seven egg sets, one of which is in WFVZ (63502). Willet's party collected three sets on Prince Is. on 15 and 17 June 1910 (WFVZ 34064 and uncat.), and Wright and Snyder (1913) observed breeding birds here in July 1912. Egg sets were collected on Prince Is. on 3 June 1928 (WFVZ 2680), 25 May 1929 (SBM uncat., two sets) and 11 June 1933 (WFVZ 65914-65916), and Sumner (1939) observed breeding birds on Prince Is. on 18 April 1939. The P.O.B.S.P. (Huber 1968) counted about 400 nests at San Miguel Is. in 1968: ca. 240 on Prince Is., 100-150 nests on Castle Rk. and ca. 50 nests on the main island.

Common Murres (Uria aalge) nested on Prince Is. at least until 1912, but have not been found breeding there since. The W.C. Bradbury collection contains eight egg sets (WFVZ) taken on 24 June 1885. Streator (1888), however, made no mention of murres a year later; however, the account of his visit in 1886 is sketchy and incomplete. H.C. Burt (Peyton unpubl. notes in WFVZ) took 13 or more egg sets on 5 June 1905; Hedrick and Appleton took somewhere between 20 and 50 sets here in June 1906 (WFVZ 76219-76224; WFVZ uncat.; Appleton unpubl. notes) and estimated that a total of 100 breeding pairs were present in three separate colonies. Willet (1910) also found about 100 pairs breeding here on a precipitous cliff on 15 June 1910, and his party collected 32 sets (WFVZ 6174-6176, 32113, 32114, 76217, 76218; WFVZ uncat.; Peyton unpubl. notes). V.W. Owen collected two sets (DM) on 8 June 1910 as

well. Wright and Snyder (1913) found several small colonies on Prince Is. and collected four sets on 12 July 1912 (WFVZ uncat.). Pemberton, however, visited the island a number of times in the late 1920's and found no birds (Willet 1933). Sumner and Bond (Sumner 1939) found a single bird present on Prince Is. on 18 April 1939, a month earlier than the commencement of breeding for this species, and were hopeful that a few were still breeding there occasionally. To our knowledge, however, none have been seen here since.

Pigeon Guillemots (Cepphus columba) have been reported by most investigators (see Willet 1910, Wright and Snyder 1913, Howell 1917, Sumner 1939) at San Miguel Is., but the only estimated numbers of breeding pairs prior to 1963 come from Craig and Sheppard (unpubl. notes), who estimated 200 pairs in 1965, and Huber (1968) who estimated 110 nests on the main island, 200 birds at Prince Is. and 30 birds at Castle Rk. in late May and early June 1968. Willet, Howard, and Owen collected four egg sets on San Miguel Is. proper between 9 and 23 June 1910 (WFVZ 6167; WFVZ uncat.; DM 3399 and 3400).

Xantus' Murrelets (Endomychura hypoleuca) were not recorded from San Miguel Is. until 18 April 1939 when Sumner (1939) saw one bird on the water 0.3 km off Prince Is. Breeding was documented in 1968 when an incubating bird was found on Castle Rk., and a chick and six broken eggshells were found on Prince Is. (Huber 1968).

All investigators have found Cassin's Auklets (Ptychoramphus aleuticus) at San Miguel Is. For Prince Is. in 1886, Streator (1888) states, "where there was any soil, it was full of burrows in every direction, made by Cassin's Auklets...". R.H. Beck collected one set of eggs on 18 May 1897 (WFVZ uncat.), possibly on an islet or rock

other than Prince Is. Burt (unpubl. notes in WFVZ) and Appleton (unpubl. notes) state, respectively, that on 6 June 1906 "the island [Prince] was almost honeycombed by the birds' burrows" and "at least 1,000 pairs breed here". They collected two sets of eggs (WFVZ 32104 and 76185). Ten sets of eggs were collected in June 1910 on Prince Is. (WFVZ 4368, 6154, 76184 and uncat.), and Willet (1910) and A. Jay (unpubl. notes in WFVZ) found them to be abundant on the island at this time. Wright and Snyder (1913) found "a very large colony" which "nested on the northwest and north slopes" of Prince Is.

J. van Denburgh found only about 100 pairs of Cassin's Auklets (unpubl. notes in WFVZ) from which he collected 11 sets on 19 May 1919, and J.R. Pemberton and D.S. DeGroot found only 50 pairs breeding here (DeGroot unpubl. notes) on 31 March 1927 and took 12 egg sets (SBM uncat. WFVZ 61969-61976, 2600, 2601). Specifically, Pemberton (unpubl. notes) mentions two separate small colonies on the north and west sides of Prince Is. It is unclear from his notes whether his estimates are of numbers of burrows seen, active burrows examined or some other parameter. Nevertheless, the figures are far lower than any other estimates prior to or since those dates (see Ainley and Lewis 1974, for discussiong of dramatic short-term population fluctuations on the Farallon Islands).

Cassin's Auklets were once again very common in 1939. Though Sumner and Bond (Sumner 1939) saw no birds when they visited Prince Is. on 18 April, they found a "considerable number of fresh burrows". Craig and Sheppard (unpubl. notes) estimated 3,000 pairs on 27 July 1965. Personnel with the P.O.B.S.P. in 1968 (Huber 1968) estimated

1,500 nests on Prince Is., a number only 1/7 of our estimate in 1975. They did not find auklets nesting on the flat top of the island, whereas we found numerous active burrows there in the ice plant. They did not determine the status, nor even mention the presence, of auklets on Castle Rk. in 1968 although they landed there. We could see numerous burrows on the islet from our boat in 1975. These data suggest that auklets were more abundant in 1975 than in 1968, though the P.O.B.S.P. estimate of only 1,500 nests on Prince Is. is probably low. Our original estimate was of 1,500-2,000 on Prince Is. in 1975; however, density/area censusing revealed many more burrows present than we had suspected and we revised our estimated to 10,000 pairs.

Tufted Puffins (*Lunda cirrhata*) were reported as nesting commonly at San Miguel Is. in 1886 (Streator 1888). Two sets of eggs were collected on Prince Is. on 5 June 1905 by Burt (WFVZ 32098; Peyton unpubl. notes), and 11 sets were collected there on 6 June 1906 by Appleton (unpubl. notes). A large colony was present on Prince Is. on 15 June 1910 (Willet 1910), and four egg sets were taken (WFVZ 4360, 6145; WFVZ uncat.; Willet unpubl. notes). A large colony was still present on 12 July 1912 (Wright and Snyder 1913). None were found by Sumner in 1939, nor have any been reliably reported since 1912.

Santa Rosa Island

This island has been visited approximately 20 times during the spring and summer, mostly by museum collectors interested in the quasi-endemic landbird populations and by egg collectors who stopped only briefly here on their way to San Miguel Is. We have found no seabird egg sets from this island and almost no accounts of breeding

seabirds.

Pemberton (1928) mentioned Brandt's Cormorants as "common" here, but no one to our knowledge has commented on its status as a breeder. Jones (unpubl. notes) observed two active Pelagic Cormorant nests at the mouth of Cañada Lobos on 26 April 1974. Western Gulls undoubtedly nest here, but apparently there has never been a colony as such. W. Abbott and P. Collins (pers. comm.) saw several isolated nests with eggs on sea bluffs in 1974 and 1975.

Pigeon Guillemots nest here, but breeding localities and numbers of breeding pairs never have been clearly defined. The species was recorded as a "common resident" by Willet (1912). Twelve individuals were seen here between 12 and 15 July 1968 (Diamond, unpubl. notes). Thirty birds were counted in Beechers Bay on 6 August, and three were seen at the mouth of Lobo Canyon on 7 August 1973 (Jones unpubl. notes). Four were seen there on 25 April 1974 (Jones unpubl. notes). None of these counts are representative of the island's breeding populations but are counts for small segments of coastline only.

There is no evidence of Cassin's Auklets' breeding on Santa Rosa Is. except for Willet's (1912, 1933) statement that it "probably breeds" here. As for Tufted Puffins, Howell's (1917) statment that "definite breeding records are lacking" for Santa Rosa Is. suggests that the species at least has been seen in the vicinity of the island during the breeding season.

Santa Cruz Island

Santa Cruz Is. has been visited more than any other Channel Island, although mostly by collectors seeking specimens of the Santa

Cruz Island Jay (Aphelocoma coerulescens insularis) and other quasi-endemic landbirds. Some information on seabirds has been gathered in 16 breeding seasons spanning the years 1912 to 1968.

Ashy Storm-Petrels were found breeding by nearly all of the egg collectors from 1912, when a small colony was discovered in Painted Cave (Wright and Snyder 1913), until 1939. Apparently all nests have been either at Painted Cave or Scorpion Harbor. Wright and Snyder (1913) found four eggs (two eggs in WFVZ uncat.) and one young bird on ledges at the former locality on 19 July 1912 and collected two incubating birds (SU 9813 and 8914). Another set was collected there on 23 June 1913 by D.R. Dickey (WFVZ 64273). Three sets of eggs (Willet 1933) and a "breeding male" (LACM 20708) were taken near the latter locality on 29 May 1928, and two sets were collected on 2 June 1928 (WFVZ 2888, 73963); three sets were taken on 19 May 1929 (Paquette unpubl. notes in WFVZ; WFVZ uncat.), and an incubating bird (SDM 17248) and ten sets were collected there on 17 May 1936 (WFVZ 1384-1386, 27676, 30306, 30307, 30318; WFVZ uncat.; Stevens unpubl. notes). Sixteen egg sets were taken on 23 May 1937 at Scorpion Harbor and Orizaba Harbor [=Painted Cave?] (WFVZ 27677, 30319-30323; WFVZ uncat.; SBM uncat.). Nineteen more sets were taken at these two localities on 22 May 1938 (WFVZ 1633-1637, 12099, 54273, 54274; WFVZ uncat.; Stevens unpubl. notes), eight more sets on 26 May 1940, and three sets at Scorpion Harbor on 25 May 1941 (WFVZ 68360; SBCM 7097-7100; Stevens unpubl, notes). To our knowledge, the last documented breeding at Santa Cruz Is. was in 1949 when Stevens (unpubl. notes) collected three more egg sets (locality unknown).

Brown Pelicans have bred only sporadically at Santa Cruz Is.

None were seen during the breeding season in 1887 (Black 1887). Several nests with young were seen by Wright in July 1909 (Willet 1912, Howell 1917). Recently, Scorpion Rk. has been the site of a small breeding colony, at least in 1972 and 1974. (Anderson and Anderson 1976).

Howell (1917) states that Double-crested Cormorants bred at Scorpion Harbor, but we can find no other evidence of breeding at Santa Cruz Is. Howell (1917) also mentions a small colony of Brandt's Cormorants near Scorpion Harbor, but there are no other references to this species on Santa Cruz Is. in the primary literature. Stevens (unpubl. notes) collected four sets of eggs on Gull Is. on 9 April 1939. Beck (1899) found Pelagic Cormorants breeding on Scorpion Rk. in 1895. No other references pertaining to breeding at Santa Cruz Is. can be found prior to 1975, though they probably breed there nearly every year. Most earlier investigators interested in seabirds devoted their time to examining the large colonies on the smaller islands; thus, cormorants were generally ignored on Santa Cruz Is.

There is no colony of Western Gulls on the main island of Santa Cruz, though the two offshore rocks, Scorpion Rk. and Gull Is., probably support yearly breeding populations. We find no specific mention of colonies on these two rocks prior to 1975 in the literature. However, egg sets were taken on 2 June 1928 (WFVZ 26115), 19 May 1929 (WFVZ 2681), 17 May 1936 (WFVZ 1376-3180, 30193, 30196, WFVZ uncat.; SBM uncat.), 23 May 1937 (WFVZ 30192, 30198; SBM uncat.; Stevens, unpubl. notes), and 25 May 1941 (WFVZ 75577). Badger (unpubl. notes) reports gulls beginning to build nests on 8 April 1919 (specific locality not given).

There are numerous reports of Pigeon Guillemots nesting at Santa Cruz Is. Several examples from the literature are given below. It was reported as "common" here 4-24 July but gone by 6 August, 1887 (Blake 1887). Wright and Snyder (1913) found it nesting in Painted Cave on 10 July 1912. Howell (1917) states that it bred in considerable numbers near the northern [=west?] end of the island. Birds were observed carrying food into sea caves on 23 May 1954 (Small 1954). Thirty or more pairs were seen nesting in a sea cave in August 1960 (Small 1960). Twice as many were seen here on 16 and 24 May 1965 as on previous May trips (McCaskie 1965c). There are three egg sets of this species, one in WFVZ (uncat.) taken by Snyder on 19 July 1912 and two in SBM (uncat.) taken by Stevens on 24 June 1945 and 26 May 1946.

There are at least 11 egg sets of Xantus' Murrelets from Santa Cruz Is. (perhaps all from Scorpion Rk.), but no specific references in the literature to their presence there. Badger took a set (WFVZ uncat.) at Scorpion Rk. and found several broken eggshells there on 20 May 1928, and obtained another set there 19 May 1929 (WFVZ uncat.). E. Harrison collected one egg set [locality?] on 17 May 1936 and another on 22 May 1938 (WFVZ 299, 301), and Stevens obtained two additional sets on 25 May 1941 (unpubl. notes). This is the last known date of nesting at Santa Cruz Is. Apparently, the egg collectors who visited Santa Cruz Is. prior to 1928 (such as Beck in 1899 and Wright and Snyder in 1912) did not find murrelets there.

There are at least three instances when Cassin's Auklets have been found breeding at Santa Cruz Is. prior to 1975. Beck (1899) found many occupied burrows with eggs and young on Scorpion Rk. on 5

June 1895. Badger (unpubl. notes in WFVZ; WFVZ uncat.) took four sets of eggs on Scorpion Rk. on 8 April 1919 and another set on 29 May 1929 (unpubl. notes); however, no one reported Cassin's Auklets breeding on Gull Is. prior to our visits in 1975.

Hewshaw recorded Tufted Puffins nesting at Santa Cruz Is. in the summer of 1875 (Willet 1912). According to fishermen, puffins bred regularly at the north [=west?] end of the island (Howell and van Rossem 1911) and several were seen by Wright and Snyder (1913) at the west end of the island on 10 July 1912.

Anacapa Island

Brown Pelicans have bred sporadically on West (and formerly Middle and East) Anacapa Is. since at least 1898. In that year, C.H. Holder (1899) found a colony in August; however, the birds were not nesting the following year in June (Willet 1912). Eleven years later, in 1910, Willet (1912) found 500 nests with eggs and young on East Is. on 5 June. The following year, pelicans were not nesting when H.C. Burt (1911) visited Anacapa Is. in May. Birds were building nests but had not yet begun to lay. Approximately 1,000 pairs were breeding on 11 and 12 May 1912 (Peyton 1913, contra Gress 1970), but only three nests contained eggs at that time (Peyton, unpubl. notes in WFVZ). Pelicans also bred in 1913 and 1915 according to Peyton (unpubl. notes). Fifteen hundred pairs were nesting on Anacapa Is. on 7 March 1912, and at least 2,000 pairs were present the following year on 2 March (Peyton 1917). Both eggs and young were observed in April and May 1919 (CAS 1297-1304; Badger, unpubl. notes). Approximately 5,000 pairs of pelicans were breeding there on 7 March 1920 (Anderson and Hickey 1970),

and one egg set was taken (SBCM 8067). A colony of only "several hundred pairs" was observed, from which approximately 50 egg sets were taken, 8 March 1922 (SBM uncat.; WFVA 17128; Petyon unpubl. notes), and an estimated 2,000 to 3,000 pairs were breeding five years later on 28 March, according to DrGroot (unpubl. notes). Several egg sets were taken in March (WFVZ 61979; SBM uncat.; Stevens, unpubl. notes) and May 1928 (MVZ 3594, 3595), and an estimated 500 pairs were present (DeGroot unpubl. notes). Two egg sets were collected by C. Ashworth on 24 February 1929 (WFVZ uncat.; MVZ 4561), and 200 nests with eggs and fledglings were observed on 9 March 1930 (Willet 1933). Stevens collected six sets on 10 March 1935 (unpubl. notes) and about 2,000 pairs were present on Anacapa Is. on 1 March 1936 (Anderson and Hickey 1970). Sumner and Bond (Sumner 1939) found 2,000 breeding pairs present on 16 April 1939, and Harrison (unpubl. notes in WFVZ) had estimated "several hundred pairs" nesting the same year on 12 March. One egg set was taken by Stevens on 12 March 1939 (SBCM 6832).

There are no more pelican nesting reports from Anacapa Is. until 1962 when G. Jensen (unpubl. notes in WFVZ) observed a colony of about 500 pairs with eggs and young on East Is. on 27 May and collected two sets of eggs (WFVZ 33312, 68533). In 1964, approximately 1,000 pairs bred successfully (Schreiber and Risebrough 1972). Nesting sites active in early April 1968 had been abandoned by mid-May (Schreiber and DeLong 1969). In 1969, at least 1272 nests were built, more than 75% received eggs, but only four young fledged (Risebrough et al. 1971). Again in 1970, breeding success was almost nil, with

only one chick hatching from 552 nesting attempts (Gress 1970). Anderson and Anderson (1976) report 540 nests on Anacapa Is. in 1971, 261 nests in 1972, 247 nests in 1973 and 416 nests in 1974. Nest totals for 1972 and 1974 include some nests on Scorpion Rk. at Santa Cruz Is.

Willet (1910) found Double-crested Cormorants breeding on Anacapa Is. on 4 June 1910; Wright and Snyder (1913) found a few pairs with recently finished nests on 5 July 1912. Dickey found quite a few breeding here in 1913 (Howell 1917). DeGroot (unpubl. notes) found "many small colonies" on 28 March 1927 and Ashworth and Thomspon (unpubl. notes in WFVZ) saw "many birds" in the colony on 15 May 1927. Badger (unpubl. notes) noted a "large colony breeding" on 17 May 1936, and Sumner (1939) stated that the species was "very numerous", most nests containing young when he and R.M. Bond visited Anacapa Is. on 16 April 1939. As late as 1963, Banks (1966 and unpubl. notes in SDM) found Double-crested Cormorants to be "fairly common" and observed a "nesting colony" on West Anacapa Is. In 1969, there were 76 nest attempts, but no young produced, on West Anacapa Is. In 1970, there were 50 nesting attempts and only three young produced, all from one nest. In 1971, 48 active nests were observed, yet no young were fledged. A first nesting attempt in 1962 was abandoned; however, a second nesting produced seven young from a minimum of 11 nests. (The 1969-1972 information is from Gress et al. 1973).

Wright and Snyder (1913) and Badger (1917) mention small colonies of Brandt's Cormorants on Anacapa Is. in July 1912 and May 1917. Ashworth and Thompson (unpubl. notes) found many nests on 15 May 1928 and

collected one set then (WFVZ 73972) and a second set on 19 April 1931 (WFVZ 27699). Bond (Sumner 1939) observed 50 pairs here in April 1934, but their status in 1939 was not determined. A few apparently bred in 1963 and 1964 (Banks 1966). Surprisingly, Brandt's seems to be the least commonly reported nesting cormorant on Anacapa Is.

Willet (1912) found Pelagic Cormorants nesting "commonly" on Anacapa Is. in June 1910, and Wright and Snyder (1913) saw several small colonies here on 6 July 1912. There is no further mention of breeding, although a few have been suspected of breeding in recent years.

Western Gulls have been found by nearly every investigator at Anacapa Is. Though many have not reported this species, none have specifically stated that it was not present. Approximately 90 egg sets have been taken since 1897 as follows: 14 sets on 2-4 June 1899 (WFVZ 21761, 34756, 34757; WFVZ uncat.; Owen, unpubl. notes); two on 5 and 6 June 1910 (WFVZ uncat.); one set on 15 May 1911 (WFVZ uncat.); one on 26 May 1917 (Badger unpubl. notes); one on 15 May 1919 (CAS 1314); 12 sets on 14 and 15 May 1927 (WFVZ 32118, 32119, 73897; WFVZ uncat.; SBCM 13652; Peyton unpubl. notes); six or more sets on 20 May 1928 (WFVZ uncat.; Peyton unpubl. notes); four sets on 19 and 31 May 1929 (WFVZ 73898; SBM uncat.; Peyton unpubl. notes); five sets on 11 May 1930 (WFVZ 73899; Peyton unpubl. notes); 13 sets on 31 May 1931 (WFVZ 30183-30188; SBM uncat.); 22 sets on 17 May 1936 (WFVZ 1367, 1368, 1370-1376, 30194, 30197; WFVZ uncat., SBM uncat.); one set each on 25 May 1941 (WFVZ 11959); and 23 May 1949 (WFVZ 21645); three sets on 27 May 1962 (WFVZ 68525-68527) and four sets on 13 May 1969 (WFVZ 35429-35432). Unfortunately, very few investigators commented on colony size. W.L. Chambers (unpubl.

notes) estimated 1,000+ pairs in 1926 and "hundreds" in 1969. Banks (1966) found "numerous" gulls breeding here in 1964 and 1965.

Pigeon Guillemots apparently breed only sporadically on Anacapa Is. Wright and Snyder (1913) reported them as nesting and collected one egg set on 5 or 6 July 1912; several nests were found on 25 and 26 May 1917 (Badger 1917), and two sets were taken (SBCM 4766; Peyton unpubl. notes); one set was taken 14 May 1927 (WFVZ uncat.); several birds were seen by Sumner (1939) at the island in April 1939; twelve birds were reported from the island on 22 May 1944 (Small 1955) and several pairs were thought to be breeding here in 1973 (Jones unpubl. notes). However, Banks (1966 and unpubl. notes) could find none here in 1963, 1964 or 1965, and Jones found only one bird present on one date (26 May) in 1974.

On Anacapa Is., Xantus' Murrelet eggs were taken by numerous collectors between 1910 and 1938 as follows: three eggs collected on 15 May 1910 (Peyton unpubl. notes); one set each collected on 15 May (Peyton unpubl. notes) and 29 May (Willet 1912) 1911; four egg sets taken on 11 and 12 May (LACM uncat.; Peyton unpubl. notes) and 5 July 1912 (WFVZ uncat.); six sets taken on 21 and 25 May 1913 (WFVZ 11324-11329); two egg sets collected on 11 June 1915 (Peyton 1917); one set each collected on 26 May 1917, 14 May 1927, and 20 May 1928 (all WFVZ uncat.). Three sets were taken 17 May 1936 (Stevens unpubl. notes). Three incubating birds were collected on 6 May 1938 (SDM 17932-17934). Murrelets were not seen by Sumner in 1939 nor by Banks in 1963, 1964 or 1965; however, about 80 birds were seen "near" the island on 22 May 1955 (Small 1955), suggesting that they may have been breeding there

then. A few have been seen near the island during the breeding season in recent years as well, including 1975.

The only evidence of Cassin's Auklets' breeding on Anacapa Is. comes from Willet (1910) who says of his trip in June 1910, "Cassin's Auklets were common at night and were undoubtedly breeding somewhere on the island, but we did not locate the nesting colony".

Wright and Snyder (1913) reported Tufted Puffins as breeding commonly on East Anacapa Is. in 1921. Willet (1913) had also found them nesting here on 4 June 1910, and a specimen was collected here on 14 August 1909 (UCLA 8946).

San Nicolas Island

Joseph Grinnell, in 1897, was the first to report on the seabirds at San Nicolas Is. and there is almost no other information available until 1968, when Ralph Schreiber conducted a study of the Western Gulls here. The only other information comes from Linton in 1910 and Rett in 1945. Apparently there are no egg sets from this island.

Grinnell (1897) found a small Brandt's Cormorant colony here in May 1897. Incomplete nests were found by Linton on 3 April 1910 (Willet 1933). Lust (pers. comm.) kept notes on a small nesting colony at the west end from around 1970 until 1974. This colony was largely unsuccessful in these years because of the frequent disturbance by people stationed on the island.

A set of Western Gull eggs was collected here on 3 June 1891 (MVZ 2110). Grinnell (1897) also found a small Western Gull colony at the northwest end of the island in May 1897, and Rett (1947) found some old nests at the west end in September 1945. Schreiber (1970) conducted

a detailed study of the breeding biology of Western Gulls here in 1968 and estimated 600 breeding pairs. A breeding colony was seen by Jones at the west end in 1974, but the size was not estimated. In extent and density it appeared similar to those in 1975.

Grinnell (1897) heard several unidentified storm-petrels and saw one fly by his tent at night in May 1897, thus implying that storm-petrels may have bred there then.

It is not clear if Brown Pelicans have bred on San Nicolas Is. Grinnell (1897) did not find them in mid-May 1897, but Schreiber and DeLong (1969) said that "records indicate that in the early 1900's they nested irregularly" there. Rett (1947) says that on 27 September 1945 he "found an area where they nest together with Brandt's and Double-crested Cormorants". (Presumably, he had found some old pelican nests among cormorant nests; however, it is very difficult to tell pelican nests from those of the Double-crested Cormorant.)

There is also no satisfactory evidence that Double-crested Cormorants have bred on San Nicolas Is. Grinnell (1897) found no evidence of nesting in May 1897, although the species was "common". Howell (1917) states that "immatures" have been found there. Rett (1947) says that he found a nesting colony here on 27 September 1945. (Presumably, he based this conclusion on the discovery of some inactive nests which he identified as those of the Double-crested Cormorant.)

Santa Barbara Island

Data on seabirds are available for 21 breeding seasons prior to 1975, beginning with J.G. Cooper's visits in 1862 and 1863. Again, the information from any one year is often spotty or pertains only to one

species.

The only evidence that Ashy Storm-Petrels may have bred here comes from L. Miller who collected two birds which came aboard his ship on the night of 10 April 1904 (MVZ 6168 and 45944).

Brown Pelicans have bred sporadically on Santa Barbara Is., though not recently. Willet (1912) found 25 pairs nesting there on 14 July 1911 and Wright and Snyder (1913) counted 300-400 birds with downy young on 2 July 1912. They collected one egg set (WFVZ uncat.). Three sets were taken on 7 May 1914 (Peyton unpubl. notes). Sumner (1939) and Bond were uncertain whether they were nesting on 14 April 1939. Banks (unpubl. notes) saw "some new nests without eggs" which he believed were pelican nests on 21-23 February 1964. Schreiber and DeLong (1969) examined National Park Service photographs which showed pelicans breeding on Sutil Rk. in 1967, the last year for which breeding is documented. Remains of old nests can still be seen near the quonset hut on the east side of Santa Barbara Is.

The Double-crested Cormorant was formerly a very common breeder on Santa Barbara Is., outnumbering even Brandt's Cormorant. An egg set was collected there by Cooper on 26 May 1963 (MVZ 1952). Grinnell (1897) found it breeding in large numbers on 15 May 1897 and collected two sets of eggs. Wright and Snyder (1913) make no mention of size, but refer to "the main colony" located on the north shore of the island on 2 July 1912, where they collected two egg sets (WFVZ uncat.). Two sets were taken on 7 May 1914 (Peyton unpubl. notes), and one set was taken by L. Wyman on 31 May 1920 (LACM uncat.). Ten egg sets were collected on 15 May 1927 (MVZ 3596-3605). Sumner (1939) reported

2,000 pairs beginning to nest on 14 April 1939. By 1972, the number of breeding pairs had dropped to 66 (Hunt and Hunt 1974) and by 1975 to 13 (see below).

Grinnell (1897) observed several large breeding colonies and collected one set of eggs (MVZ 573) of Brandt's Cormorant on Santa Barbara Is. in May 1897, but he gave no estimates of actual numbers. Howell (1917) mentions large rookeries here in May 1908. Wright and Snyder (1913) visited a large colony here (thus implying that there were other colonies) in July 1912 and counted 250 nests with eggs. They took four egg sets. More than 100 nests with eggs were seen (Wyman unpubl. notes in LACM), and one egg set was taken 30 May 1920 (LACM uncat.). Four sets were taken and 125 nests were seen here on 27 March 1927 (WFVZ 34459, 34460, 2916, 2917; Pemberton unpubl. notes). Sumner (1939) observed ca. 1,000 birds building nests here in April 1939. Only one certain nest was found in 1972 (Hunt and Hunt 1974), although an active search for colonies was not made, and several areas where cormorants breed were not checked. Several nests were observed in 1973 (Jones unpubl. notes) without active searching. Eighty-six active or recently active nests were counted here on 11 July 1974 after many birds had finished breeding (Jones and Jehl unpubl. notes).

Grinnell (1897) recorded small numbers of Pelagic Cormorants breeding in May 1897. Sumner (1939) states that the species was "present, but in considerably smaller numbers than the preceding two species".

Santa Barbara Is. has always had a relatively large breeding colony of Western Gulls, perhaps larger in earlier years than it is

today. Grinnell (1897) states that he saw "immense numbers" in May 1897, "nesting on the outer margins of the mesa, nearly the whole way around the island" and "a good many were nesting on the sides of the hills in the center of the island" as well. He took at least one egg set (MVZ 549). Chambers' party estimated 1,000 birds (500 pairs?) on 4 June 1899 (Owen unpubl. notes) and collected two egg sets (WFVZ uncat.). Willet (unpubl. notes; WFVZ uncat.) collected three egg sets on 11 to 18 June 1911. Wright and Snyder (1913) found gulls breeding in four separate colonies on Santa Barbara Is. in July 1912 and collected an egg set (WFVZ 27311; MVZ 5637-5640), and L. Wyman collected eight sets on 29-31 May 1920 (LACM uncat.). A.H. Miller collected 11 egg sets here on 15 May 1927 (MVZ 3709-3719). J.R. Pemberton collected 23 sets on 6 May 1928 (WFVZ 2657-2679). Sumner (1939) and Bond estimated 3,000 birds beginning to nest on 14 April 1931, a number very similar to the 1510 territorial pairs counted by Hunt and Hunt (1974) on 7 July 1972.

Pigeon Guillemots have been recorded for at least 11 years prior to 1975 and probably have bred on Santa Barbara Is. every year. Grinnell (1897) collected four sets of eggs on 15 May 1897, one of which is in MVZ (404); birds were observed carrying food on 3 July 1912 (Wright and Snyder 1913), and a recently-fledged chick was observed on 11 July 1974 (Jones and Jehl unpubl. notes). Birds were present also in 1899 (CAS 34682, 38791, 38792); 1909 (UCLA 7694, SU9037-9040); 1912 (UCLA 11101); 1920 (LACM 4599); 1939 (Sumner 1939; LACM 50444); 1960 (Small 1960); 1968 (Diamond unpubl. notes; Jones unpubl. notes); 1972 (Hunt and Hunt 1974) and 1973. High counts of 50 and 60 were made on 1 June 1973 and on 29 June and 5 July 1974, respectively (Jones unpubl.

notes). Apparently, no investigators visiting the island between March and July have failed to find this species, which suggests that it is present every year.

Xantus' Murrelets have also been recorded by most investigators on Santa Barbara Is. It was reported by Cooper (1870) in the 1860's but, surprisingly, was not found by Grinnell in May 1897. One nest and several murrelet remains were found by Wright and Snyder (1913) on 2 and 3 July 1912. Howell (1917) suggests that the species was threatened by cats on the island. Sumner (1939) found a pair of murrelet wings on 14 April 1939. Numerous nests have been found since 1972 (Hunt and Hunt 1974; Jones unpubl. notes).

A set of Cassin's Auklet eggs (MVZ 1950) was collected here by Cooper, who found the species to be abundant, on 26 May 1862. Grinnell (1897) found a large breeding colony in May 1897 and collected one egg set (MVZ 405). He states, "the southwest side of the mesa from the top of the bluff to the summit of the hill was crowded with their burrows". Robertson (1903) also found them to be common breeders in June 1899. However, by 1908 the colony had been completely abandoned, apparently due to the presence of cats which had been introduced sometime after 1899 (Howell 1917). On 14 June 1911 Willet (1912) found a small colony of about 100 pairs on a detached rocky islet nearby [Sutil?]. On the main island he found only bones and feathers all over the island and concluded that they had been "exterminated by the cats with which the island is infested:. Wright and Snyder (1913) found a similar situation on the main island 13 months later, but the presence of many flocks of auklets offshore suggested that they were still breeding on the offshore islets. Sumner (1939) and Bond found a few

burrows, possibly auklet burrows, usually placed under matted, thorny [=Lycium californicum?] bushes, near the northeast corner of the island. Banks (unpubl. notes) saw a few auklets in the vicinity of the island and heard what he thought were probably auklets at night from 21-23 February 1964, but he could find no burrows. He may have heard Xantus' Murrelets rather than Cassin's Auklets.

Grinnell (1897) on several occasions saw about a dozen Tufted Puffins flying about the bluff on the north side of the island between 13 and 18 May 1897. Burrows that, according to Wright and Snyder (1913), "undoubtedly belong to this species" were seen on 4 July 1912, as were five birds that were in the vicinity of the island on the same date.

Santa Catalina Island

Schreiber and DeLong (1969) suggest that Brown Pelicans may have nested here irregularly in the early 1900's, but we can find no evidence that even suggests breeding here. There is also no concrete evidence for Double-crested Cormorants having bred here, though Grinnell (1898) says that it breeds on Santa Catalina Is. and Howell (1917) states that it "breeds on Ship Rock".

Brandt's Cormorants formerly bred on Santa Catalina Is., presumably on Bird and Ship Rocks as evidenced by the four sets of eggs taken by Willet (1912) on 11 April 1904. No evidence of breeding was found in a complete circuit of the island on 9 July 1974 (Jones and Jehl unpubl. notes).

Western Gulls probably breed every year on Bird Rk. but data are scanty. Wright obtained an egg set [colony locality unknown] on 12 May 1908 (WFVZ 2654); six egg sets were taken on 5 May 1914 (Peyton

unpubl. notes) [again, locality not given]; one set was collected on 27 May 1928 [locality not given] (SBCM 4639). C.A. Harper (1971) conducted a study of Western Gull breeding biology on Bird Rk. in 1965 and 1966. He counted 24 and 25 active nests, respectively, in those years.

D. Bleitz (unpubl. notes) reported a pair of Xantus' Murrelets breeding on Brid Rk. in 1967.

San Clemente Island

L. Miller collected an Ashy Storm-Petrel (MVZ 6167) which came aboard his ship at night while anchored just off the island on 8 April 1904. Another was collected aboard ship anchored at night near Pyramid Pt. on 30 August 1935 (UCLA 32214). These two records are suggestive of breeding or attempted breeding here. There is no good evidence that Double-crested Cormorants have bred here, though a set of eggs taken 3 May 1914 were tentatively identified as belonging to this species (Peyton unpubl. notes). There is only indirect evidence that Brandt's Cormorants nested here prior to 1972. Linton (Howell 1917) reported it as "breeding in small numbers on the northwest coast of the island" around 1907. Leatherwood and Coulombe (unpubl. notes) observed nests with young at Seal Cove on 9 April 1972. Jones noted about 150, some of which appeared to be breeding, near the mouth of Red Rock Canyon on 9 June 1973, and Jones and Jehl observed 22 or more active and old nests in three localities here on 10 July 1974.

Western Gull nesting has been poorly documented at San Clemente Is. I.D. Nokes collected a set of eggs here on 3 May 1914 (Peyton unpubl. notes). Jones (unpubl. notes) saw one nest with three eggs on

a coastal sea bluff near the mouth of Red Rock Canyon on 19 June 1973 and suspected one or two pairs in the vicinity to be breeding.

Xantus' Murrelets probably breed at least occasionally at San Clemente Is. in small numbers. Willet (1912) reports that Wright saw them at San Clemente Is. and believed that they bred there; however, Howell (1917) considers this highly improbable. Two downy chicks with two adults were seen near China Pt. on 27 July 1968 (Jones unpubl. notes).

La Jolla Caves, San Diego County

Brandt's Cormorants were reported roosting here by Michael (1935), and in October of 1933 he observed and estimated 500 individuals on the cliffs. An unspecified number of these birds apparently nested successfully, producing young of at least fledgling size (Michael 1935). Hubbs et al. reported approximately 2,000 cormorants (99% Brandt's Cormorant) roosting on the cliffs, while a "considerable number nested" (Hubbs et al. 1970). McCaskie (pers. comm.) reports the species no longer nests here, but birds still roost on the cliffs.

Double-crested Cormorants have traditionally roosted in this area, although in smaller numbers than Brandt's Cormorant. Nearly 100 birds roosted here in 1933, and some individuals were present during the spring of 1934, but Michael (1935) does not specifically mention their nesting. Only 1% of the estimated 2,000 cormorants present in the 1940's were of this species (Hubbs et al. 1970). Again, no specific mention is made of their nesting here through the late 1960's by Hubbs et al. 1970. And, like Brandt's Cormorant, the species does not nest here now (McCaskie pers. comm.).

APPENDIX A4
SEABIRDS:

Species Accounts:

K.T. Briggs, E.W. Chu, G.L. Hunt, Jr.
H.L. Jones, D.B. Lewis, and W.B. Tyle

APPENDIX III-A4

Species accounts

We present here accounts for each species encountered in the course of our surveys. For each, we give a brief outline of range, status in southern California and food habits, followed by month-by-month summaries of our observations in the Southern California Bight. We do not intend the background section to be a complete review of the literature on that species. Rather, we attempt to provide an overview that may prove useful to readers unfamiliar with the distribution and habits of the species in question.

Index to Species Accounts

Common Loon (*Gavia immer*)

The Common Loon is a regular winter visitor along the coasts of southern California. These birds once nested as far south as northeastern California (and may still do so casually), but now are fairly limited to nesting on freshwater lakes throughout Canada and Alaska (Palmer 1962). Southbound migration, which takes place both coastally and inland, begins in September, but the birds do not reach the southern California coast until mid-October.

Many Common Loons winter on marine coasts where they prefer nearshore waters, bays, and inlets (Grinnell and Miller 1944, Small 1974). Offshore distribution, size, and yearly variation of the winter population of this species are incompletely known for the southern California region. They occur in small numbers around the Channel Islands from mid-December to late May (Jones in prep.). Scott (1974) contends that Common Loons are actually present in greater numbers during migration than in winter, but supporting evidence is equivocal.

By April, the diurnal journey northward has begun, and long flight streams may be seen up to 50 km offshore, but usually nearer the coast. Five thousand Common Loons were observed passing Goleta Pt. between April and mid-May, 1975 (McCaskie 1975c), but the methods used to generate that figure were not described.

Fish account for approximately 80% of the Common Loon's diet in all localities (Palmer 1962). Prey species vary regionally, but on the coast, fish such as rockfish, flounder, herring, and sculpin are representative. Crustaceans, molluscs, and aquatic insects and plants may also be taken (Bent 1919, Palmer 1962).

Common Loon (continued)

1975-76 Baseline Data

April 1975. Two birds observed along the northern Santa Rosa-Cortés Ridge on the 19th: one sighted about 10 km off Cluster Pt., Santa Rosa Is.; the other 40-50 km north of Santa Barbara Is.

May 1975. The latest spring record was a bird sighted off Pt. Mugu S.B. in the company of other loons.

June - September 1975. None recorded.

October 1975. The first fall record was a single bird off China Pt., Santa Catalina Is., late in the month.

November 1975. A number of loons appeared along the mainland coast this month. The only positive identifications of Common Loons were seven birds off Border Field S.B., and one bird off Pt. Mugu S.B. Unidentified loons at other sites may have been of this species.

December 1975. Loons became common along the mainland in December, but records of Common Loons were few. This species was reported only from McGrath S.B. and South Carlsbad S.B., but they may have gone unidentified elsewhere. Single birds were also sighted off the west end of Santa Cruz Is., and offshore, 20 km off Dana Pt.

January 1976. Large numbers of loons (many unidentified) were again recorded along the mainland coast, but none were identified as this species. Two Common Loons were sighted on the east side of San Miguel Is.

February 1976. Loons remained common along the mainland coast, but the only inshore record for this species was two birds off Huntington S.B. in mid-month. Two individuals were sighted off San Miguel Is. on the 12th.

March 1976. Loons were still present along mainland beaches, but no Common Loons were identified. The only positive sightings were one 10 km north of Santa Cruz Channel, another 9 km south of Santa Cruz Is. Possibly a third bird was seen 14 km southeast of Santa Rosa Is.

Arctic Loon (Gavia arctica)

The Arctic Loon is the most commonly observed loon along the coast of southern California. They are most abundant in winter and migration, but records exist for all seasons. The birds of the North American populations nest on the larger, deeper lakes of northern Canada and Alaska (Palmer 1962). Southbound migration is strictly coastal and the earliest birds reach the California coast by September (possibly non-breeders) (Palmer 1962). Arctic Loons usually travel by day, and often well out to sea. In many years, long flight streams may be seen from coastal promontories, with rates exceeding 500 birds per hour. By late November, wintering birds have penetrated south to the tip of Baja California (Palmer 1962).

Arctic Loons are described by most authors as the most pelagic of the loon species (Grinnell and Millet 1944, Small 1974), but are commonly seen in coastal waters in winter. They are frequently seen around the Channel Islands from late October to early June (Jones in prep.). Pyle and DeLong (1968 ms) describe them as casual in winter in the P.O.B.S.P. Eastern Grid area (over 100 km offshore). Data are lacking on winter population size and annual fluctuation for the southern California region. Northbound migration begins in April and continues through early June. Eighteen thousand birds passed Goleta Pt., Santa Barbara Co., from April to mid-May, 1975 (McCaskie 1975c), but the methods used to derive that figure were not given.

Diet seems to vary with locality, but prey such as fish, crustaceans, molluscs, and aquatic insects and plants are most often named (Bent 1919, Palmer 1962).

Arctic Loon (continued)

1975-76 Baseline Data

April 1975. Arctic Loons went unrecorded along the mainland coast in April, but a flock of 150-200 unidentified loons sighted off Pt. Mugu S.B. were probably of this species. On the 19th they were distributed along the northern Santa Rosa-Cortés Ridge as follows: 51 birds, 5-10 km south of Cluster Pt., Santa Rosa Is.; 42 birds, 22 km southeast of Gull Is., Santa Cruz Is., tapering off to three birds about 40 km northwest of Santa Barbara Is. On the 21st, a ship census along the line from Santa Barbara Is. to San Pedro Harbor reported Arctic Loons as follows: one bird west of the 118°35' line, 29 birds (+45 unidentified loons) from the 118°35' line east to Pt. Fermin, and many (with unidentified loons) in San Pedro Channel. Offshore censuses were not conducted this month.

May 1975. One sighted off Pt. Mugu S.B. was the only record for the mainland coast this month, but a loose stream of 240+ birds observed there on the 11th was probably this species. Mid-month inshore records include four birds south of Santa Cruz Is. and one bird northwest of San Miguel Is. A large concentration was reported offshore in the area between San Clemente Is. and Santa Barbara Is. north of latitude 33°30'N. These birds were 10-20 km from land. Eleven birds were seen inshore at Santa Rosa Is. on the 28th.

June 1975. One bird 5 km west of Pt. Vicente on the 16th.

July 1975. The last record of the season was five birds at Pt. Mugu S.B. in mid-month. These may have spent the summer in southern California.

August 1975. None were recorded, however, small numbers may have been overlooked among unidentified loons.

Arctic Loon (continued)

September 1975. Unrecorded. Again, individuals may have been overlooked among unidentified loons that were sighted.

October 1975. A few unidentified loons were present along the mainland coast. The only Arctic Loons recorded were a group of 30 at Sandy Pt., Santa Rosa Is., sighted late in the month (Table III-A4-159).

November 1975. Loons became more common along the mainland coast by mid-month. Arctic Loons were recorded off P.M.T.C., Pt. Mugu (three birds); Pt. Mugu S.B. (four birds); and South Carlsbad S.B. (three birds). (Table III-A4-160) Arctic Loons were widely distributed offshore and, as they were the only loon identified, all unassigned loons seen more than 10 km from land are assumed to be this species (Fig. III-A4-251) areas of concentration included the waters south of Santa Cruz Is., south and southeast of Anacapa Is., north of San Nicolas Is., surrounding Santa Barbara Is., west of San Clemente Is. (out to 50 km), and west of San Diego (out to 100 km). These birds were absent south of Santa Rosa Is. and along the northern Santa Rosa-Cortés Ridge. Santa Barbara Channel was not censused.

December 1975. Loons remained common off the mainland beaches this month, but few were identified as being of this species. The few island records were from Santa Rosa Is., but unidentified loons reported from Santa Cruz Is. and Santa Barbara Is. may also have been this species. Arctic Loon numbers were greatly reduced offshore this month (even though unidentified loons seen more than 10 km from shore are assumed to be this species). Scattered individuals and small flocks were observed south of the northern islands, northwest of Santa Barbara Is., north and west of Tanner and Cortes Banks, and in the Gulf of Santa Catalina. They went unreported in Santa Barbara Channel (Fig. III-A4-251a).

Table III-A4-159.

ɘquency of sightings of Arctic Loons
ɔtal individuals)on and near Channel Island beaches, April 1975 through
rch 1976. Numbers in parentheses refer to specific locations on Figures
I-178 through -185. Dash indicates area not surveyed or survey incomplete.

Date→ cation Type→	27-30 Oct 75 Air	16-19 Dec 75 Air	14-16 Jan 76 Ship	22-25 Jan 76 Air	11-15 Feb 76 Ship	16-22 Mar 76 Ship
N MIGUEL IS.						
Richardson Rk. (103)	0	0	-	0	-	-
West (102,110-20,160,170)	0	0	0	0	4	0
South (146-51)	0	0	7	0	1	0
East (101,140-45)	0	0	1	0	1	0
North (121-40)	0	0	8	0	8	0
ɩNTA ROSA IS.						
West (611-12,625)	30	12	0	2	-	-
South (620-24)	0	3	7	12	0	1021
East (618-19,629)	0	4	4	0	-	-
North (610,613-17)	0	1	2	0	-	-
ɅNTA CRUZ IS.						
West (641,658)	0	-	0	40	-	-
South (650,653-56)	0	-	0	18	0	24
East (649,651)	0	-	0	0	-	-
North (640,643-48)	0	-	0	0	-	-
NACAPA IS. (660-80)	0	-	0	-	0	0
AN NICOLAS IS.						
Northwest (210-60)	0	-	-	0	-	-
Southwest (203)	0	-	-	0	-	-
Southeast (202)	0	-	-	0	-	-
Northeast (201)	0	-	-	0	-	-
›ANTA BARBARA IS.(300-330)	0	0	0	0	0	0
›ANTA CATALINA IS.						
Northwest (506-07,515, 525-27)	0	0	-	0	-	-
Southwest (503-05,529)	0	0	-	0	-	-
South (502,523-24)	0	0	-	0	0	-
East (501,509-11)	0	0	-	0	1	-
Isthmus (508,521-522)	0	0	-	0	0	-
SAN CLEMENTE IS.						
Northwest (409-11)	0	0	-	1	-	-
West Central (406-08)	0	0	-	0	-	-
Southwest 404-05)	0	0	-	0	-	-
Pyramid Cove (402-03)	0	0	-	-	-	-
East 401,412)	0	0	-	-	-	-

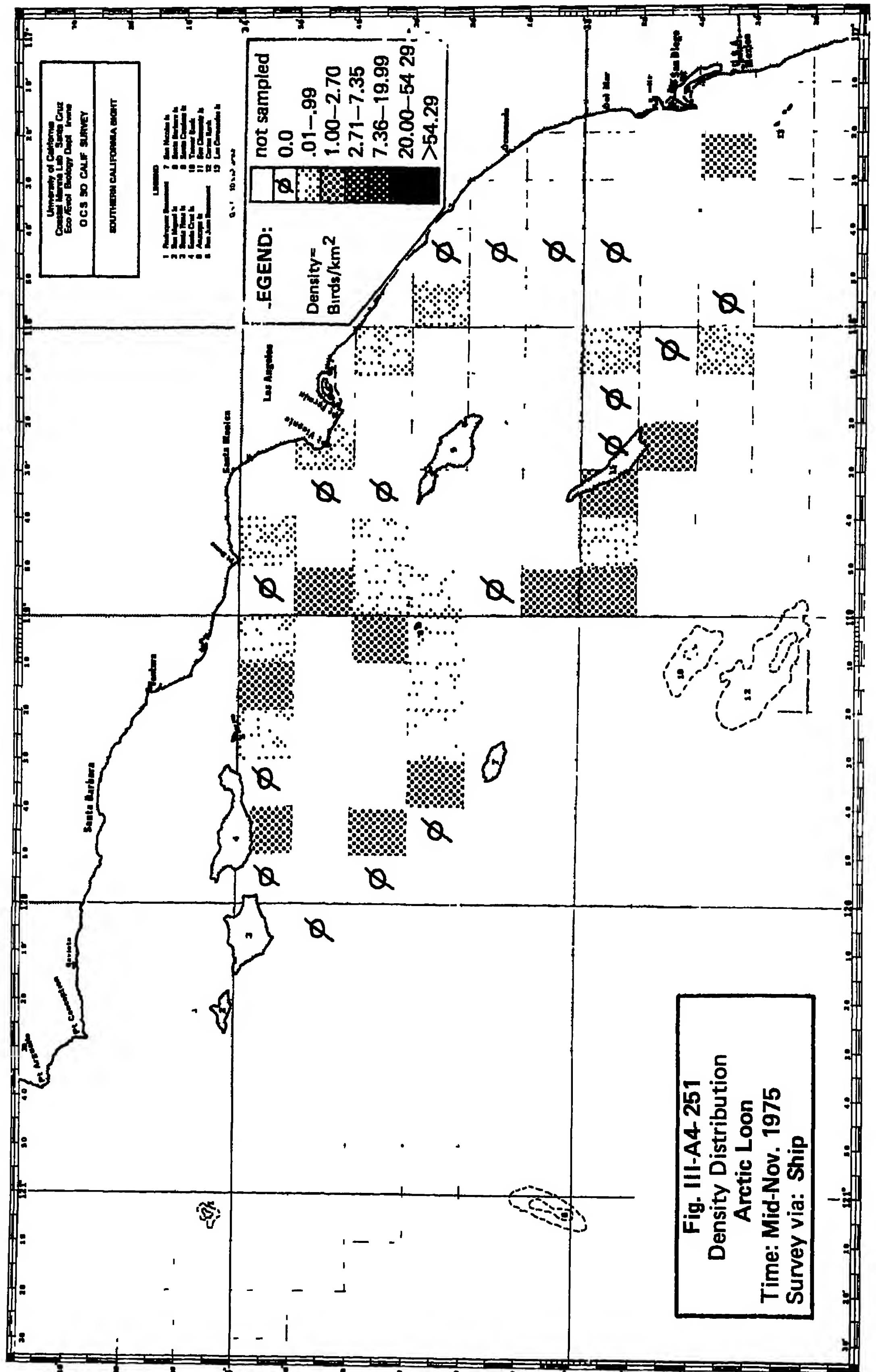


Fig. III-A4-251
Density Distribution
Arctic Loon
Time: Mid-Nov. 1975
Survey via: Ship

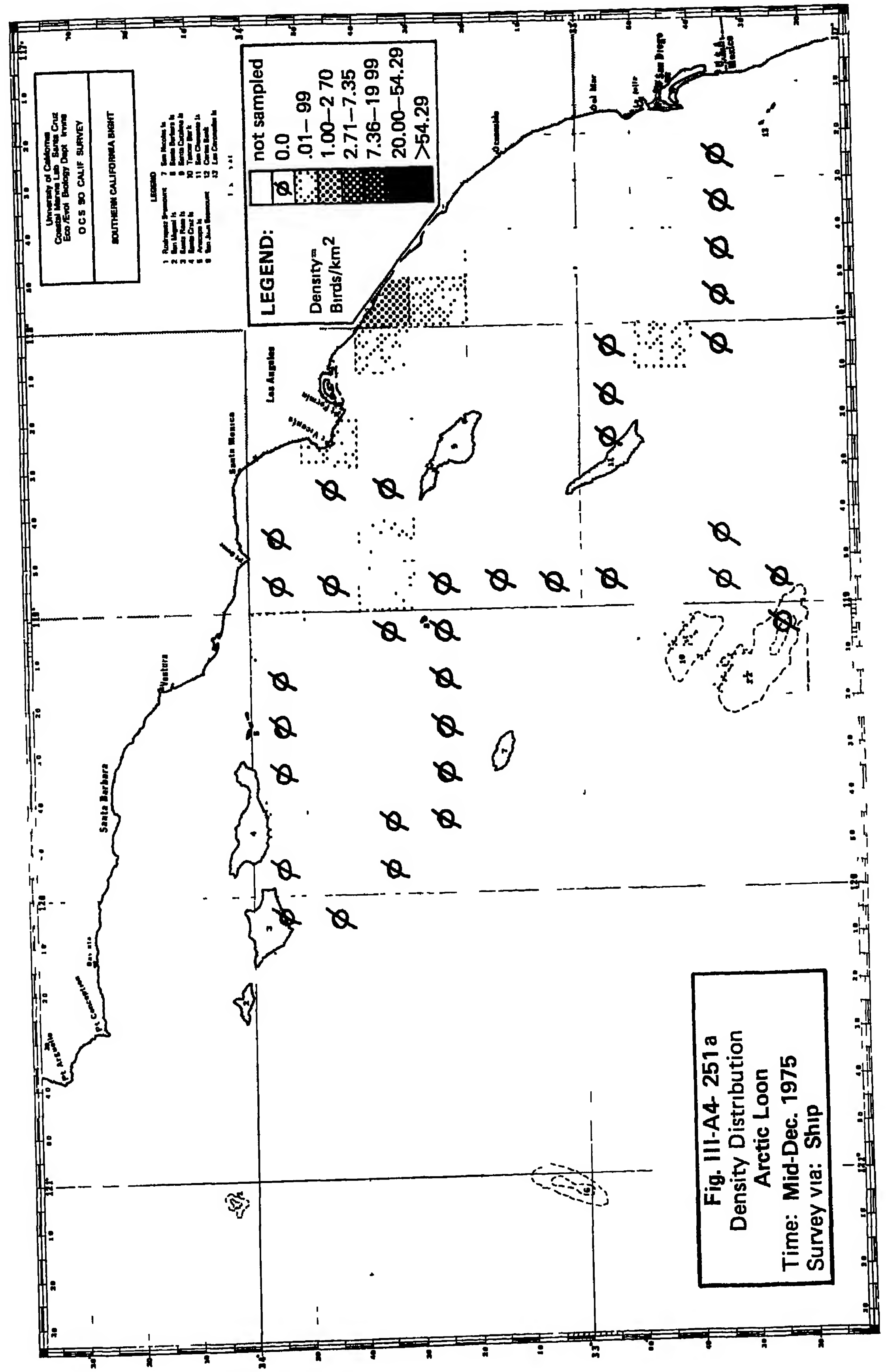


Fig. III-A4-251a
Density Distribution
Arctic Loon
Time: Mid-Dec. 1975
Survey via: Ship

(total individuals) at selected southern California beaches April 1975 - ...
Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	0	-	0	-	-	0	-	0	0	0
11-24 May	0	0	3	0	-	1	0	0	0	0	0	0	4
13-19 June	0	0	0	0	-	0	0	0	0	0	0	0	0
11-18 July	0	0	0	0	0	5	0	0	0	0	0	0	5
1-7 August	0	0	0	0	0	0	0	0	0	0	0	0	0
11-18 September	0	0	0	0	0	0	0	0	0	0	-	-	0
15-18 October	0	0	0	0	0	0	0	0	0	0	-	-	0
6-14 November	0	0	0	0	3	4	0	0	3	0	0	0	10
4-11 December	0	0	0	0	0	0	0	0	0	1	0	3	4
11-18 January, 1976	2	0	1	0	1	0	0	4	0	0	0	0	8
16-24 February	0	13	3	0	0	2	0	0	0	0	1	1	20
11-22 March	0	0	0	0	0	3	0	0	0	0	0	0	3

Arctic Loon (continued)

January 1976. Loons were again common along the mainland coast this month, but Arctic Loons were identified from only two beaches. This species was common inshore around the northern islands, and other inshore sightings were recorded southeast of San Nicolas Is., and northwest of San Clemente Is. An aerial survey on the 6th found these birds abundant in Santa Barbara Channel (concentrated at the east end). Offshore records were few and scattered (Fig. III-A4-252.) Surveys late in the month found them still abundant in Santa Barbara Channel and common 10-20 km west of Newport Beach, but virtually absent offshore (Fig. III-A4-252a).

February 1976. The status of loons generally, and Arctic Loons specifically, remained the same along the mainland coast this month. Inshore records were restricted to the northern islands, except for a single bird on the east side of Santa Catlina Is., and several more 5-10 km west of San Diego. Offshore records were scarce, with one bird in the Gulf of Santa Catalina, and another 20 km southeast of Santa Barbara Is. Santa Barbara Channel was not censused.

March 1976. Loons in general became less common along the mainland coast this month, and reports of Arctic Loons were few. They remained common around the northern islands, and were especially concentrated 4 km southeast of Santa Rosa Is. where over 1,000 were observed on the 20th. Aerial surveys reported large numbers of unidentified loons in the eastern end of Santa Barbara Channel (Fig. III-A4-253). Records offshore were again scarce. Three loons were observed off Santa Barbara Is., one of which was identified as this species. Unidentified loons north of Santa Catalina Is. and south of San Clemente Is. may have been of this species.

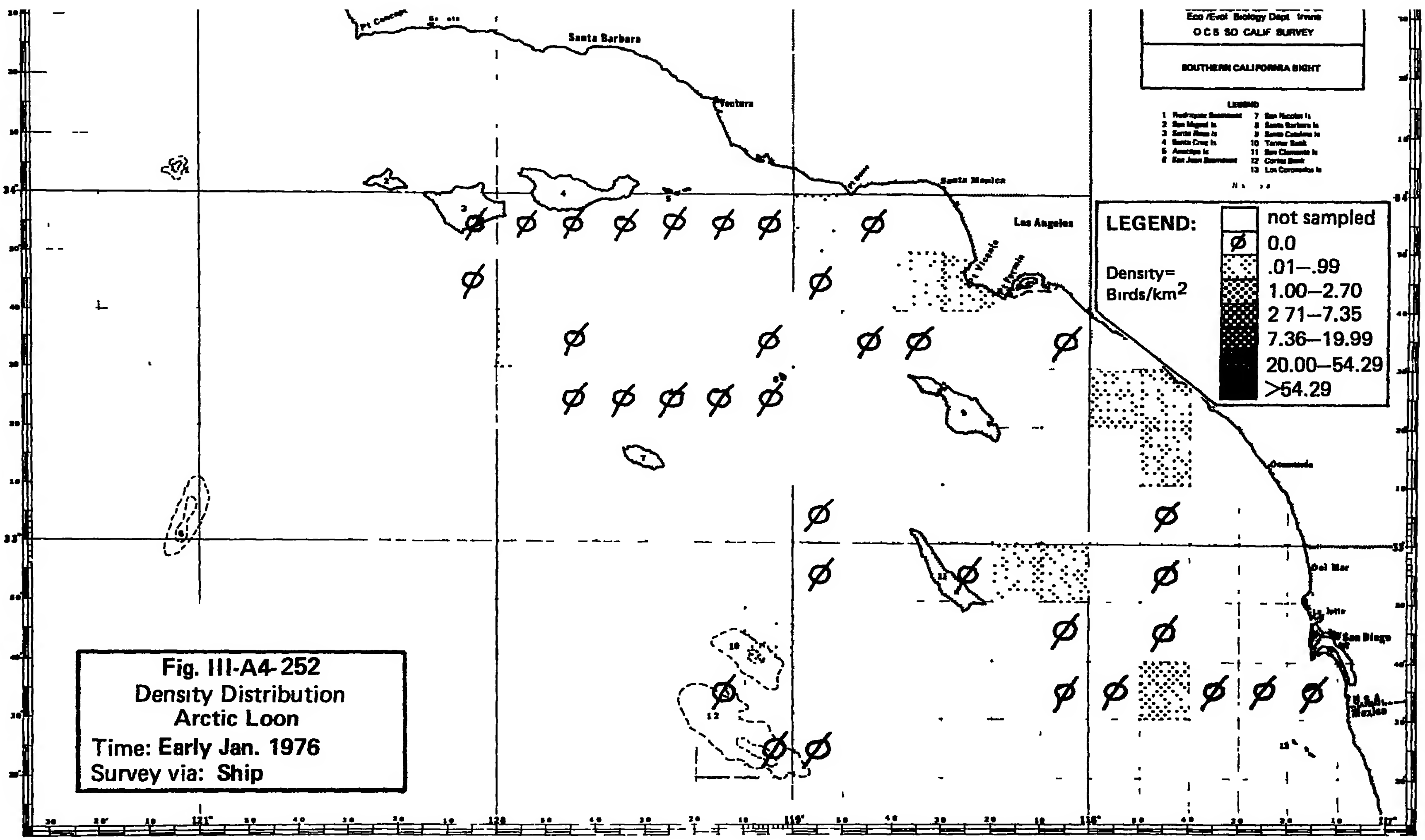


Fig. III-A4-252
Density Distribution
Arctic Loon
Time: Early Jan. 1976
Survey via: Ship

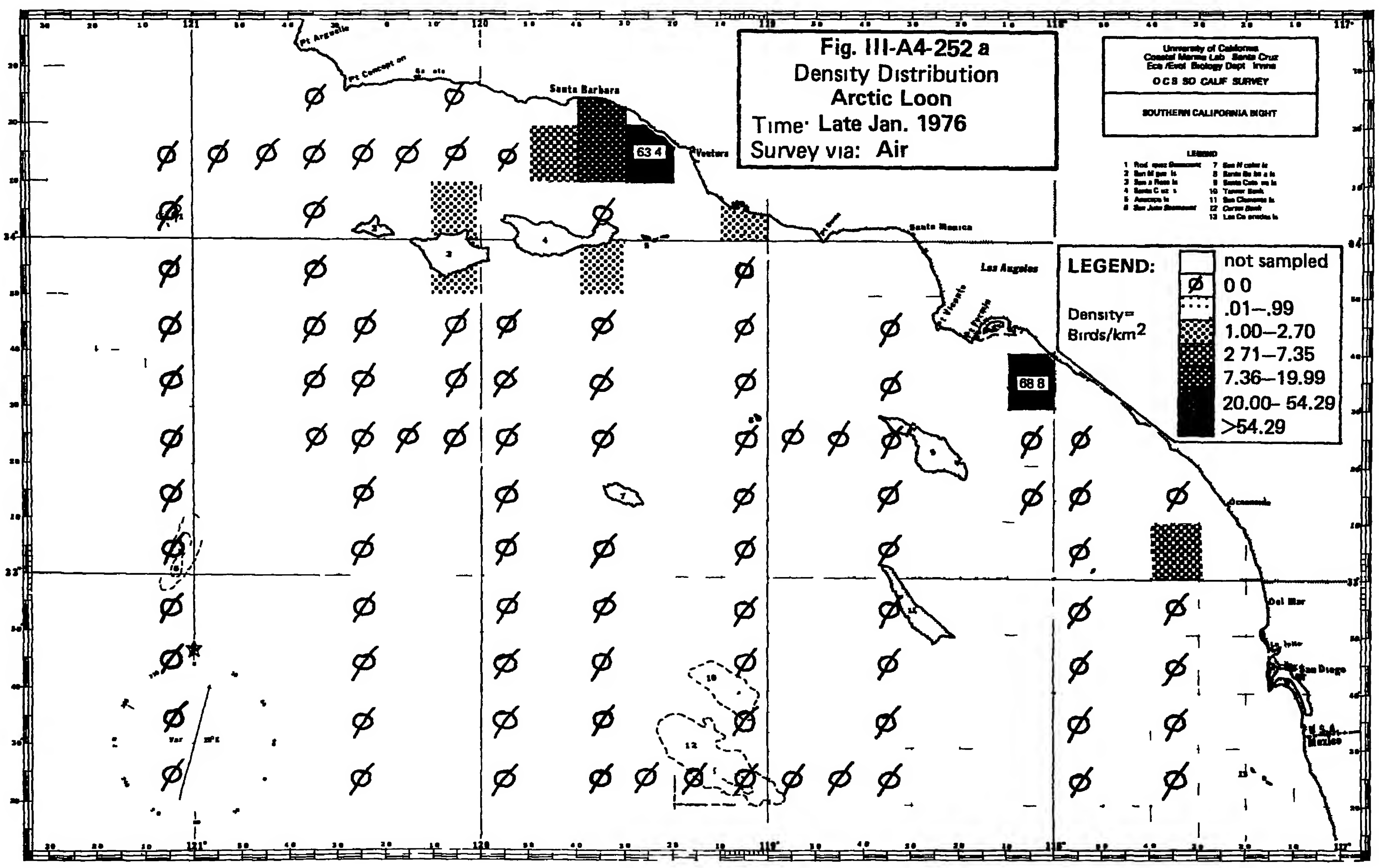


Fig. III-A4-252 a
Density Distribution
Arctic Loon
Time: Late Jan. 1976
Survey via: Air
University of California
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
LEGEND:
Density=
Birds/km2
not sampled
0 0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
63.4
68.8
Santa Barbara
Ventura
Santa Monica
Los Angeles
Del Mar
San Diego
120°
119°
118°
117°
121°
34°
33°

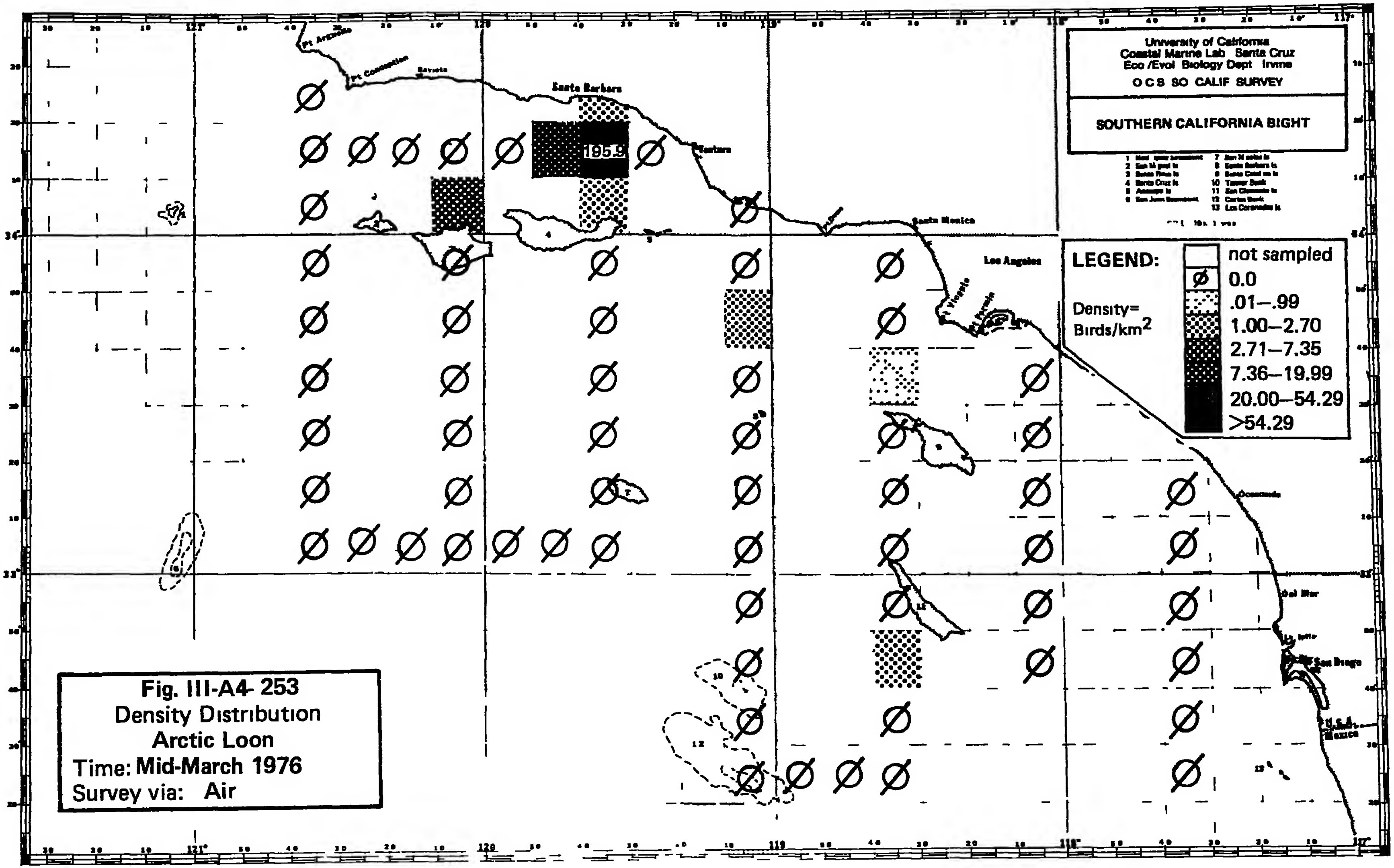


Fig. III-A4-253
Density Distribution
Arctic Loon
Time: Mid-March 1976
Survey via: Air

Red-throated Loon (Gavia stellata)

The Red-throated Loon is a regular winter visitor to coastal California (Grinnell and Miller 1944, Small 1974). It is most often observed in migration and winter, but occasionally young or non-breeding birds spend the summer in southern California. The North American population of these loons summers near the west and north coasts of Canada and Alaska, where they nest in small, shallow freshwater ponds (Palmer 1962). There is some post-breeding dispersal inland, but migration is entirely coastal. The earliest migrants reach the southern California coast in October.

These loons winter along the west coast from Canada to Mexico (Palmer 1962). They are described as the loon having the most inshore distribution and tend to frequent protected bays and other calm water areas (Grinnell and Miller 1944, Palmer 1962). They are only occasionally seen around the Channel Islands (Jones in prep.). Scott (1974) describes them as common in Santa Barbara Channel, but this is probably not correct.

This species migrates north earlier than the preceding two species and may arrive earlier in fall as well. By March, Red-throated Loons have begun their northbound flight, and pairs or small groups may be seen along the coast until early May. Migration is often near the mainland coast, which may explain why Scott (1974) erroneously describes this species as the most abundant loon in southern California during migration. McCaskie (1975c) reported 4,500 Red-throated Loons passing Goleta Pt. from April to mid-May, 1975.

These loons feed primarily on fish, with prey species varying with locality. Other food items include crustaceans, molluscs, and shrimps along the coast, leeches, aquatic insects and plants inland (Bent 1919, Palmer 1962).

Red-throated Loon (continued)

1975-76 Baseline Data

April 1975. Few loons were observed along the mainland coast, but birds of this species were recorded off three of the six mainland beaches that were censused. Some part of a large flock seen off Pt. Mugu (see Arctic Loon - April 1975) may have been Red-throated Loons. The only offshore record was a single bird just outside San Pedro Bay.

May 1975. The only record along the coast was a single bird off Pt. Mugu S.B., but part of a large unidentified loon flow seen there on the 11th (see Arctic Loon - May 1975) may have been of this species.

June 1975. An exceptionally late or locally summering bird was seen inshore on the north side of Santa Cruz Is. on the 13th.

July - August 1975. None recorded.

September - October 1975. Unrecorded, but some of the early-arrival, unidentified loons observed along the coast may have been of this species.

November 1975. Loons increased along the mainland coast with Red-throated Loons recorded at P.M.T.C., Pt. Mugu (two birds) and South Carlsbad S.B. (eight birds). There were no island or offshore records.

December 1975. Loons continued to increase along the mainland coast; Red-throated Loon being the most common species along most beaches with a high count of 28 (with 28 unidentified loons), off San Onofre S.B. The only island record was two birds on the south side of Santa Cruz Is.. Some of the unidentified loons reported from Santa Cruz and Santa Rosa Islands may have been this species. There were no offshore records.

January 1976. Loons remained common off mainland beaches and Red-throated Loons were reported at most sites (Table III-A4-161). A few were observed south of Santa Cruz Is. and around Santa Rosa Is. No offshore records.

(total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	0	-	2	-	-	1	-	1	0	4
11-24 May	0	0	0	0	-	1	0	0	0	0	0	0	1
13-19 June	1	0	0	0	-	0	0	0	0	0	0	0	1
11-18 July		None	recorded										
1-7 August		None	recorded										
11-18 September		None	recorded								-	-	
15-18 October		None	recorded								-	-	
6-14 November	0	0	0	0	2	0	0	0	0	8	0	0	10
4-11 December	0	0	2	0	0	3	0	0	28	12	9	0	54
11-18 January, 1976	0	0	5	0	11	3	1	1	4	0	0	0	25
16-24 February	5	0	1	0	27	11	0	7	55	0	0	0	106
11-22 March	0	3	2	0	17	9	1	0	7	0	0	0	39

Red-throated Loon (continued)

February 1976. Loons were common off the mainland coast, with Red-throated Loon the most abundant species (Table III-A4-161). High counts were recorded at San Onofre S.B. (55), and P.M.T.C., Pt. Mugu (27). The only island records were several birds around Santa Cruz Is., and one bird south of Santa Rosa Is. on the 13th, unless some of the unidentified loons observed around San Miguel Is. were this species. The only offshore record was a single bird 10 km south of Anacapa Passage.

March 1976. Loon numbers declined along the mainland coast, but Red-throated Loons remained the most common species. High counts were again from San Onofre S.B. (seven birds with 73 unidentified loons), and P.M.T.C., Pt. Mugu (17 birds) (Table III-A4-161). They were present around Santa Cruz and Santa Rosa Islands, but were greatly outnumbered there by Arctic Loons. None were recorded offshore, but one bird in Santa Barbara Channel (with Arctic Loons) was identified as this species.

Horned Grebe (Podiceps auritus)

The Horned Grebe is an uncommon winter visitor to the California coast; summer records are scarce. Their breeding range is widespread throughout western Canada, with a few birds nesting in Alaska and the northern United States (Palmer 1962). Palmer (1962) states that nests are most often built on ponds, marshes with open water, or sheltered areas of lakes and streams. The portion of the Horned Grebe population that winters along the Pacific Coast moves back to the coast of Washington and British Columbia by mid-October. From there they disperse along the coast north and west to the Aleutians and south to Baja California. This species is fairly common along the northern California coast in mid-winter becoming increasingly less common southward.

In March and April the wintering range contracts; birds from north and south return to staging areas along the coasts of Washington and British Columbia, and from there move inland to the nesting grounds (Palmer 1962). Summer records along the coast are few (McCaskie 1967d).

In marine waters, Horned Grebes may be seen along most seacoasts (rocky or sandy), in bays or estuaries, and occasionally, well offshore (Grinnell and Miller 1944, Palmer 1962, Small 1974). They occur in small numbers around the northern Channel Islands from December through April (Jones in prep.).

Palmer (1962) refers to a 1924 stomach-contents analysis by Wetmore, which showed the diet of the grebe to be 99% animal matter. Bent (1919) states the winter diet is chiefly small fish, shrimps and other small crustaceans.

Horned Grebe (continued)

1975-76 Baseline Data

April - November 1975. None recorded.

December 1975. The first winter record was four birds observed in the east lagoon, P.M.T.C., Pt. Mugu, on the 9th. Unrecorded elsewhere along the mainland coast. Fifteen were recorded on the west coast of Santa Rosa Is., and unidentified grebes recorded from all coasts of Santa Rosa Is. were either these or Eared Grebes. None were recorded from other islands or offshore.

January 1976. A single Horned Grebe observed on the east lagoon at P.M.T.C., Pt. Mugu, on the 14th was the only definite record along the mainland coast. Five small grebes at South Carlsbad S.B. on the 12th may have been this species. None were recorded around the islands or offshore, but it is possible that some of the unidentified small grebes sighted at the east end of Santa Barbara Channel were this species.

February 1976. One observed at Border Field S.B. on the 17th and one at Dockweiler S.B. on the 18th, were the only records for the mainland coast. Eight were recorded inshore around San Miguel Is. in mid-month. Unrecorded for other islands and offshore.

March 1976. Three observed on the east lagoon at P.M.T.C., Pt. Mugu, on the 17th were the only records for the mainland coast in March. Seven small grebes sighted at Pt. Mugu S.B. on the 16th may have been this species. The only island record was two birds seen inshore of south Santa Rosa Is. No offshore records.

Eared Grebe (Podiceps nigricollis)

The Eared Grebe is found throughout the year in southern California, but numbers are greatly reduced coastally in summer, when a majority of the birds move inland to breed. The birds breed throughout the western half of the United States and southern Canada, except for a belt along the coast which starts north of San Francisco Bay (Palmer 1962). Palmer (1962) states that sheltered, shallow, reedy portions of medium-to-large lakes are preferred nesting habitat. Fall movement to the south and west occurs from August to November, with birds reaching the coast of Baja California in October.

Eared Grebes winter along the Pacific coast from Canada to Central America. Winter habitats include near-coast freshwater lakes and the quiet waters of bays, harbors, lagoons and estuaries (Palmer 1962, Small 1974). They are common in southern California in most winters. Inshore records exist for many mainland sites and all of the Channel Islands. There are few data available concerning size and fluctuation of the winter Eared Grebe population, but Scott (1974) states they outnumber Horned Grebes by about 10:1 in the Southern California Bight.

Spring migration is primarily nocturnal, and by May most have left coastal habitats. They are highly gregarious, even in spring, and large groups may disappear from the coast overnight. A few birds over-summer along the coast (McCaskie 1965-75).

Information on coastal food sources is scarce, but both Bent (1919) and Palmer (1962) state that insects are the preferred food. Small fish, crustaceans and molluscs are listed as supplementary food sources.

Eared Grebe (continued)

1975-76 Baseline Data

April 1975. Unrecorded along the mainland coast but inshore along the southern sides of the northern islands flocks numbering in the hundreds were recorded, particularly in the kelp beds of Anacapa and Santa Cruz Islands (Table III-A4-162). None recorded offshore.

May 1975. Recorded at one of eight mainland beaches censused. On the 11th, four were observed off Pt. Mugu S.B. (Table III-A4-163). Island records were: two inshore on the south side of San Miguel Is. on the 13th, and a single bird inshore on the south side of Santa Cruz Is. on the 25th. The latter sighting was the last spring record.

June - September 1975. None recorded.

October 1975. Eight observed at McGrath S.B. on the 17th, and a flock of 35 seen south of Mugu Lagoon were the only positive sightings. Nine unidentified grebes in Santa Barbara Channel and a single unidentified grebe within 20 km of the coast south of San Clemente, may have been of this species.

November 1975. Records for the mainland coast include three birds at McGrath S.B. on the 7th, three more at Pt. Mugu S.B. on the 11th, and one at South Carlsbad S.B. on the 14th, (Table III-A4-163). No aerial censuses were made in November, but ship surveys recorded individuals 20 km north of Santa Barbara Is., and 15-20 km west of San Clemente Is.

December 1975. A total of 20 were sighted along the mainland coast. Four Birds were recorded at four of the five northernmost mainland beaches censused (Table III-A4-163). Inshore island records included seven birds on the south side of Santa Cruz Is. and six on the north side of Santa Rosa Is., but some of the 40 unidentified grebes sighted around Santa Rosa Is.

Table III-A4-162.

equency of sightings of Eared Grebes
otal individuals)on and near Channel Island beaches, April 1975 through
rch 1976. Numbers in parentheses refer to specific locations on Figures
I-178 through -185. Dash indicates area not surveyed or survey incomplete.

Date→	22-25 Jan 76	11-14 Feb 76	16-22 Mar 76						
cation Type→	Air	Ship	Ship						
N MIGUEL IS.									
Richardson Rk. (103)	0	-	-						
West (102,110-20,160,170)	0	63	0						
South (146-51)	0	21	0						
East (101,140-45)	0	0	0						
North (121-40)	0	126	0						
NTA ROSA IS.									
West (611-12,625)	0	-	-						
South (620-24)	0	2150	1342						
East (618-19,629)	0	-	-						
North (610,613-17)	0	-	-						
NTA CRUZ IS.									
West (641,658)	0	-	-						
South (650,653-56)	0	389	225						
East (649,651)	0	-	-						
North (640,643-48)	-	-	-						
ACAPA IS. (660-80)	-	43	0						
N NICOLAS IS.									
Northwest (210-60)	0	-	-						
Southwest (203)	0	-	-						
Southeast (202)	0	-	-						
Northeast (201)	0	-	-						
NTA BARBARA IS.(300-330)	37	0	2						
NTA CATALINA IS.									
Northwest (506-07,515, 525-27)	0	0	-						
Southwest (503-05,529)	0	-	-						
South (502,523-24)	0	-	-						
East (501,509-11)	0	5	-						
Isthmus (508,521-522)	0	18	-						
AN CLEMENTE IS.									
Northwest (409-11)	1	-	-						
West Central (406-08)	0	-	-						
Southwest 404-05)	0	-	-						
Pyramid Cove (402-03)	-	-	-						
East 401,412)	-	-	-						

Table III-A4-163. Frequency of sightings of Eared Grebes (total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	0	-	0	-	-	0	-	0	0	0
11-24 May	0	0	1	0	-	4	0	0	0	0	0	0	5
13-19 June		None recorded			-								
11-18 July		None recorded											
1-7 August		None recorded											
11-18 September		None recorded									-	-	
15-18 October	0	0	0	8	0	0	0	0	0	0	-	-	8
6-14 November	0	0	0	3	0	3	0	0	0	1	0	0	7
4-11 December	0	0	7	2	4	0	3	4	0	0	0	0	20
11-18 January, 1976	0	1	6	0	12	0	5	0	0	0	0	0	24
16-24 February	2	5	78	1	5	2	0	0	0	0	7	0	100
11-22 March	0	0	1	3	6	7	0	0	0	0	0	0	17

Eared Grebe (continued)

may have been this species. A few were observed offshore in December: four birds were seen 6-8 km southwest of Cluster Pt., Santa Rosa Is., one, 5 km off the southeast coast of Santa Rosa Is., one, 10-15 km southeast of Santa Barbara Is., and three, 5-8 km west of Pt. Loma.

January 1976. Recorded from the mainland coast were five birds at Dockweiler S.B. on the 13th, and 12 at P.M.T.C., Pt. Mugu on the 13th and 14th. Five unidentified grebes at South Carlsbad S.B. on the 12th may have been this species. In mid-month, Eared Grebes were observed inshore on the south and west sides of Santa Cruz Is. Later in the month, 37 birds were recorded inshore around Santa Barbara Is. and one on the northwest side of San Clemente Is. None were recorded offshore, but some of the unidentified grebes sighted in Santa Barbara Channel may have been of this species.

February 1976. Fifteen were recorded from four mainland beaches in mid-February (Table III-A4-163). Inshore concentrations were noted around five of the Channel Islands this month. A total of 2,792 birds were counted around the four northern islands, including 2,150 on the south side of Santa Rosa Is. (Table III-A4-162). Another 23 birds were sighted inshore northeast of Santa Catalina Is. There were no offshore records for February. Santa Barbara Channel was not censused.

March 1976. Six Eared Grebes at P.M.T.C., Pt. Mugu, on the 17th, and three at McGrath S.B. on the 18th were the only confirmed records for the mainland coast, but seven birds sighted at Pt. Mugu S.B. on the 16th may also have been this species (Table III-A4-163). Numbers decreased around the islands in March, but concentrations of 1,342 birds inshore on the south side of Santa Rosa Is., and 225 birds inshore south of Santa Cruz Is. were observed on the 18th (Table III-A4-162). Two were sighted inshore at

Eared Grebe (continued)

Santa Barbara Is. in mid-month. The only offshore record was of a single bird sighted about 10 km northeast of Santa Barbara Is.

Western Grebe (<u>Aechmophorus occidentalis</u>)

The Western Grebe is a resident breeding bird in northern California, but except for a few non-breeders, it is absent from the coast in summer. It breeds in the interior where it is common from central California through central Canada. Small numbers may nest irregularly south to northeast Baja California. These grebes generally use large, tule-edged lakes (often at higher altitudes) for nesting, but the colonies vary annually with the lake conditions (Palmer 1962).

Fall migration dates may vary annually, but on average, the first migrants arrive on salt water in late September, and by late October they are distributed south to Mexico (Palmer 1962). On marine water, these grebes frequent quieter near-shore bays, lagoons and inlets. Historically, they were common to abundant along the southern California coast in winter (Grinnell and Miller 1944, Scott 1974, Small 1975), and records exist for all of the Channel Islands (Jones in prep.). In recent years, several authors have expressed the belief that the species may be declining coastally (Bender et al. 1974, De Sante et al. 1973). Actual size and yearly fluctuation of the winter Western Grebe population are incompletely known for the Southern California Bight.

The northbound flight, which may be coastal or inland, takes place in March and April. Migration is usually of short duration; arrival and departure of large numbers of birds may be abrupt. They seem to exhibit a high degree of gregariousness throughout the year (Palmer 1962).

Western Grebes are almost exclusively fish eaters (Bent 1919, Palmer 1962). Along the coast, prey species may include herring (<u>Clupea</u> sp.) and cabezon (<u>Leptocottus armatus</u>). Palmer (1962) also lists molluscs, crustaceans, and polychaete worms as marine food sources.

Western Grebe (continued)

1975-76 Baseline Data

April 1975. Recorded at four of the six mainland beaches censused. Counts ranged from 30 birds (Border Field S.B. and Silver Strand S.B. on the 11th) to 625 birds (San Onofre S.B. on the 14th) (Table III-A4-164). None were reported around the Channel Islands or offshore.

May 1975. Recorded at three of the eight mainland beaches censused in April. Counts ranged from 36 (Dockweiler S.B. on the 11th) to 211 (Pt. Mugu S.B. on the 11th) (Table III-A4-164). None were recorded around the Channel Islands or offshore.

June 1975. The final spring record was of 68 birds at San Onofre S.B. on the 19th. None were recorded around the Channel Islands or offshore.

July - August 1975. None recorded.

September 1975. The first fall record was of 36 birds at P.M.T.C., Pt. Mugu, on the 15th. None recorded around the Channel Islands and offshore.

October 1975. Recorded at three of the seven mainland beaches censused. Counts ranged from 12 birds at P.M.T.C., Pt. Mugu, on the 16th, to 40 birds at McGrath S.B. on the 17th. Single birds were observed on the south coast of San Miguel Is. and the west coast of San Clemente Is. late in the month. There were no offshore records.

November 1975. Western Grebes became more widespread along the mainland coast in this month; they were recorded at seven of nine beaches censused. Counts ranged from one bird at McGrath S.B. on the 7th, to 210 birds at Silver Strand S.B. on the 13th, averaging about 70 birds per beach (Table III-A4-164). Pairs of this species were observed inshore along the north and south sides of Santa Cruz Is. on the 8th and 9th. They were absent around other Channel Islands and offshore.

(total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	0	-	55	-	-	625	-	30	30	740
11-24 May	0	0	0	0	-	211	36	50	0	0	0	0	297
13-19 June	0	0	0	0	-	0	0	0	68	0	0	0	68
11-18 July	0	0	0	0	0	0	0	0	0	0	0	0	0
1-7 August	0	0	0	0	0	0	0	0	0	0	0	0	0
11-18 September	0	0	0	0	36	0	0	0	0	0	-	-	36
15-18 October	0	0	0	40	12	0	24	0	0	0	-	-	76
6-14 November	2	0	2	1	117	8	78	0	0	18	210	62	516
4-11 December	5	0	0	311	204	0	757	3	123	2	1	1	1407
11-18 January, 1976	0	0	0	22	192	0	660	570	0	42	42	0	1528
16-24 February	18	2	14	1	315	1	119	515	118	20	63	3	1189
11-22 March	12	0	14	31	260	15	965	493	111	0	11	598	2510

Western Grebe (continued)

December 1975. Western Grebes remained common along the mainland coast; they were present at eight of the nine beaches censused. Four of the five southernmost beaches had counts lower than five birds, but four of the six northernmost beaches had counts exceeding 100 birds (Table III-A4- The high count was 757 birds off Dockweiler S.B. on the 4th, and the total for the coast was 1,402 birds. Island records for the month were five birds inshore north of Santa Cruz Is., and six birds inshore east and one bird inshore south of Santa Rosa Is. - all in mid-month. They were recorded offshore for the first time all year, but only on aerial censuses. Observations included nine birds along the 117°30'W longitude line within 10 km of Oceanside; one bird 10-20 km west of Pt. Vicente; and one bird within 5 km of the southwest shore of Santa Cruz Is. All records this month were of birds within 20 km of land.

January 1976. Present at six of the nine mainland beaches censused this month. Counts ranged from 22 birds at McGrath S.B. on the 14th to 660 birds at Dockweiler S.B. on the 13th (Table III-A4-164). None were recorded inshore around the Channel Islands, but three birds were seen within 8 km west of Pt. Loma on the 9th. Offshore records included five birds, 5-15 km west of Ventura on the 6th, 13 there two weeks later, and eight birds south of Long Beach within 20 km of shore. No birds were recorded more than 25 km from land.

February 1976. Recorded at all nine mainland beaches censused. The total count for the mainland shore was 1,155 birds, with a high of 515 birds at Huntington S.B. on the 16th (Table III-A4-164). Inshore island records were restricted to the northern islands this month, with birds concentrated south of Santa Rosa Is. and north and south of Santa Cruz Is. (Tables III-A4-164-165). No birds were recorded offshore.

Table III-A4-165. Distribution of sightings of Western Grebes on Channel Islands beaches, October 1975 through March 1976. Numbers refer to specific locations on Figs. III-178 through III-185.

Date	Location	Number
23-26 October	San Miguel Is. south (145-151)	1
	San Clemente Is. west central (406-08)	1
16 December	Santa Rosa Is. south (620-24)	1
	Santa Rosa Is. east (618-19, 629)	6
11-14 February	Santa Rosa Is. south (620-24)	17
	Santa Cruz Is. south (650, 653-56)	2
	Anacapa Is.	1
14-18 March	Santa Rosa Is. south (620-24)	4
	Santa Cruz Is. south (650, 653-56)	4

Western Grebe (continued)

March 1976. Western Grebes reached their greatest abundance along the mainland coast this month, and they were recorded at eight of the nine beaches censused. The total count for the coast rose to 2,498 birds, with a high of 965 off Dockweiler S.B. on the 16th (Table III-A4-164). Inshore island records were again from the northern islands only, with concentrations north and south of Santa Cruz Is., and south of Santa Rosa Is. (Table III-A4-165 /). A single bird was observed in the east end of the Santa Barbara Channel, 20 km west of Ventura in mid-month.

Red-necked Grebe (Podiceps grisegena)

The Red-necked Grebe is a regular winter visitor to the coast of California, but is very rare south of Morro Bay (Grinnell and Miller 1944, Small 1974). It breeds inland from Alaska south to the northernmost western United States (Palmer 1962), and casually into Oregon (Kebbe 1958). Palmer (1962) states that birds may nest on any quiet inland lake (not small ponds) that has emergent vegetation in a variety of open and wooded habitats. There is usually some degree of post-breeding dispersal through the interior in late summer, but most birds return to salt water by mid-November (Palmer 1962).

Red-necked Grebes range in winter along the Pacific coast as far north as coastal Alaska and in lower numbers south to central California. They are most often observed inshore along the open coast and in large bays and estuaries (Grinnell and Miller 1944, Small 1974), but a few may turn up well offshore (Palmer 1962). There are fewer than two dozen records from the California Bight and no records from Mexico.

On marine waters they eat small fish such as herring and sculpin, supplemented by crustaceans and varied worms. Inland, insects are a major food source (Bent 1919, Palmer 1962).

1975-76 Baseline Data

One record, see p. III-589.

Black-footed Albatross (Diomedea nigripes)

The breeding habits and distribution of the Black-footed Albatross are some of the most studied and best known of any truly pelagic North Pacific seabird (Rice and Kenyon 1962a and 1962b; see Sanger 1974a for distribution review and discussion). Breeding adults from the estimated world population of 300,000 birds in 1956-58 (Rice and Kenyon 1962a) nest exclusively in the Leeward Hawaiian Island chain (Palmer 1962). The breeding season extends from October through July, by which time all adults and fledglings have departed for the sea.

The pelagic range of this species covers the North Pacific Ocean from the coasts of China, Japan and the Soviet Union eastward to continental North America, and from the southern Bering Sea and the Gulf of Alaska southward almost to the equator. There is a tendency toward greater concentrations, which shift with the seasons, around the perimeter of this vast area, especially along the eastern edge. Some work has been done associating this distributional pattern with environmental factors such as winds, currents and water temperature (Sanger 1974a). Not unexpectedly, densities increase in the north in summer (non-breeding season) and in the south in winter (as the breeding season approaches). Although the birds occurring off Washington and Oregon in winter are probably largely non-breeders, the simultaneous presence of both parents is not needed at the nest site, and it is physically possible for them to forage as far away as the North American west coast and return to the breeding grounds within two to three weeks (Sanger 1974a).

In southern California there is a regular influx of Black-footed Albatross in April through May which may be explained by the exodus of adults from breeding islands, coupled with strong seasonal upwelling

in southern California waters. Most authors agree that the species is present in all months but is least abundant in winter (Grinnell and Miller 1944, Pyle and DeLong 1968 ms, Sanger 1974a, Scott 1974, Small 1974). During the 1966-68 POBSP survey of the Eastern Grid, an area of open ocean west of the California Channel Islands, the numbers of Black-footed Albatrosses remained fairly steady all year; still, peak counts were reported in July, and the yearly low was reached in January (Pyle and DeLong 1968 ms). Most of the birds occurring in this area are dark-rumped, presumably immature individuals, but white-rumped birds have been recorded, especially in summer and early fall.

The Black-footed Albatross has been called the "feathered pig" (Miller 1940); it feeds on any edible refuse, especially animal, and is particularly fond of fatty garbage discarded from ships. Its chief natural foods are fish, fish offal, fish eggs, crabs and other crustaceans, squid and even sea urchins. Algae, probably Macrocystis, forms a part of its diet off the California coast (Palmer 1962).

The mean annual life span of these birds is somewhere between 15 and 35 years with an annual mortality rate of 3% (Palmer 1962).

1975-76 Baseline Data

April - August 1975. None recorded.

September 1975. A total of 13 birds was seen during two ship surveys in this month (Fig. III-A4-254). Most of these were found near Tanner and Cortés Banks; two birds were seen west and southwest of San Nicolas Is. and one 15 km northwest of San Clemente Is.

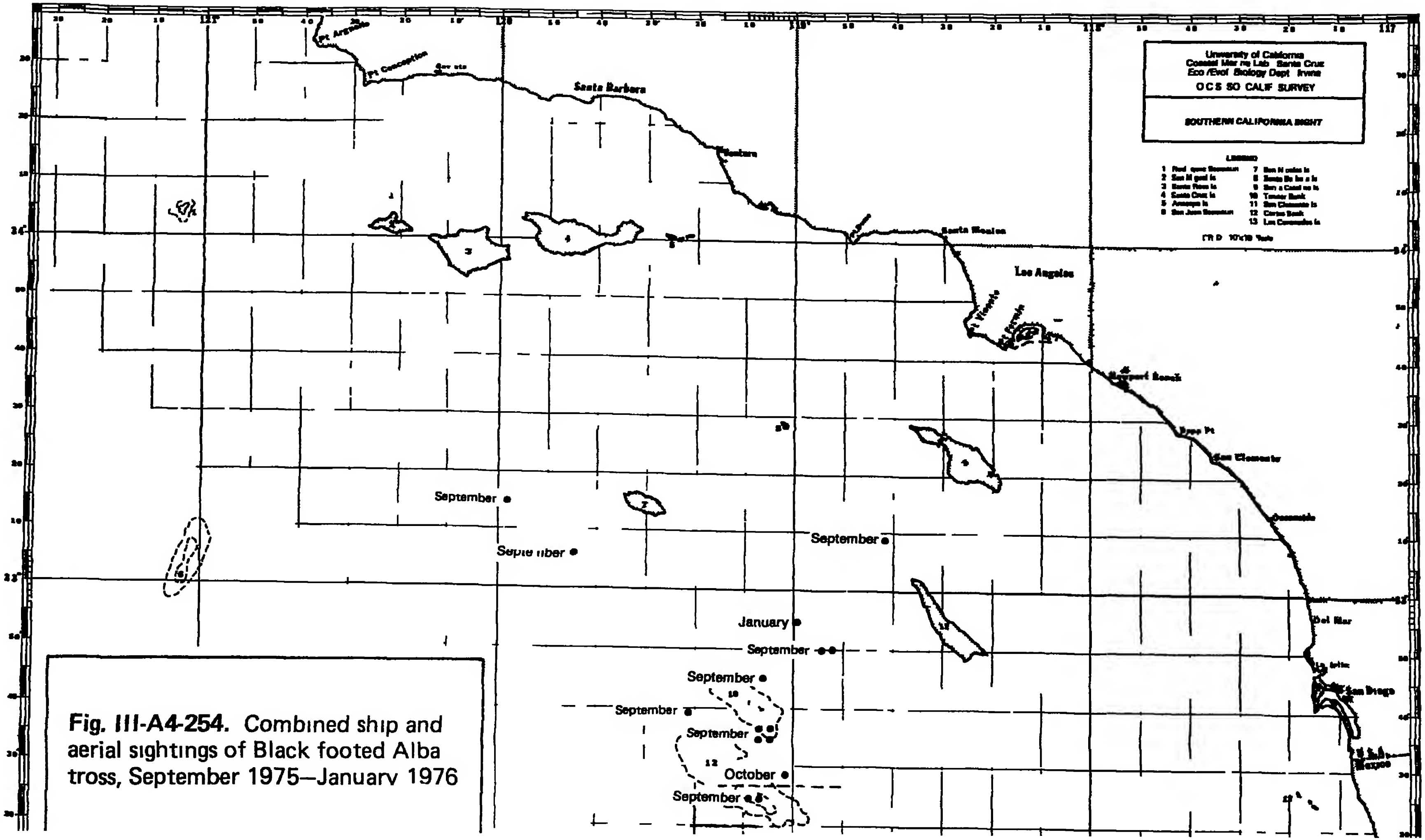


Fig. III-A4-254. Combined ship and aerial sightings of Black footed Alba tross, September 1975—January 1976

Black-footed Albatross (continued)

October 1975. One individual was recorded along the eastern flank of Cortés Bank late in the month during aerial surveys.

November - December 1975. None recorded.

January 1976. A single bird was seen from the air 43 km west of San Clemente Is. (Fig. III-A4-252).

February - March 1976. None recorded.

Laysan Albatross (Diomedea immutabilis)

Although the world population of the Laysan Albatross numbers some five times that of the Black-footed Albatross (1.5 million birds in 1956-58, Rice and Kenyon 1962a), the habits and distribution of the Laysan Albatross are much less well documented. The Black-footed Albatross is a confirmed ship-follower and consequently has been seen and studied more than the shyer Laysan Albatross. Sanger (1974b) extensively reviews the current literature on this species' distribution and its possible environmental correlates.

The Laysan Albatross' breeding area is now virtually restricted to the leeward chain of the Hawaiian Islands (Rice and Kenyon 1962a, 1962b, and Palmer 1962 for account of breeding biology and life history). Breeding birds arrive on the islands the first week in November; adults begin leaving the central Pacific area in May, and by the end of August all adults and fledglings are at sea, dispersing to the north. Like the Black-footed Albatross, the Laysan Albatross may forage widely, even during the breeding season. It ranges over the North Pacific Basin from Japan to the North American coast; and from the southern Bering Sea and the Gulf of Alaska to 13°N in the central Pacific. The southern limits of its distribution are uncertain, but the species does not seem to disperse as far south in the eastern and western Pacific as in the central portion.

There is a latitudinal shift in density with the seasons similar to that in the Black-footed Albatross population: concentrations increase in the far north in the summer and fall, and move south in the winter. The species is considered uncommon to common far offshore in the winter from Baja California to the coast of British Columbia (Sanger 1974b). In

Laysan Albatross (continued)

southern California the Laysan Albatross is a "casual" winter visitor (October through March) to offshore areas (Pyle and DeLong 1968 ms, Small 1974). Records also exist for April and May (Grinnell and Miller 1944, McCaskie 1975c). Pyle and DeLong (1968 ms) suggest that the birds seen in southern California may be immatures retreating southward from northern latitudes at summer's end. On the other hand, nearly half the adults are absent from the central Pacific breeding grounds at any one time, and banding records show that adults can and do forage at great distances (Kenyon and Rice 1958).

Squid apparently constitutes the mainstay of the Laysan Albatross' diet, although seeds and berries are also eaten on the breeding grounds (Palmer 1962). The life span and mortality of this species are probably comparable to those of the Black-footed.

1975-76 Baseline Data

One record, see p. III-591.

Cape Petrel (Daption capense)

The Cape Petrel is a common inhabitant of Antarctic waters. It is highly pelagic, seldom alighting on ice or land except during the breeding season. Its nests are located entirely within antarctic or subantarctic regions, in cliff niches, hollows, grottoes or shallow burrows on islands or the Antarctic mainland. The species is widely distributed throughout the Southern Hemisphere, moving into the tropics in the non-breeding season. It occurs at sea in flocks or as singles, often in the company of other petrels. This bird is a persistent ship-follower, easily attracted by garbage thrown overboard. Stragglers may follow ships to north of the equator.

There is only one generally accepted record for this species in the Northern Hemisphere (McCaskie 1970c) and no specimen or photograph. Though various authors (Palmer 1962, Grinnell and Miller 1944, Peterson 1973, McCaskie 1966) list other records for this species, Bourne (1967) considers all to be unsatisfactory.

The diet of the Cape Petrel is varied, consisting of planktonic crustaceans of the genus Euphausia, blood, fat and flesh of whales and other marine mammals, fish, squid, other crustaceans and refuse. It feeds by stirring up surface water with vigorous paddling and pecking on either side (Palmer 1962).

1975-76 Baseline Data

One probable record, see p. III-591.

Northern Fulmar (Fulmarus glacialis)

The habits and distribution of the Northern Fulmar are the best known of any of the Procellariidae. The species nests in colonies on cliff ledges in the far northern Atlantic and Pacific Oceans. Over the last century, fulmar populations have increased rapidly and expanded southward into warmer, subarctic waters of both northern oceans. The species' pelagic dispersal is widespread and marked by distinct seasonal, yearly, and geographic variation.

During flight years Pacific birds migrate at least as far south as southern Baja California (specimen, San Diego Natural History Museum); however, in other years they may occur only to northern California. Data from the past ten years from Audubon Field Notes (now American Birds) and the present authors' field notes illustrate the erratic nature of this species' winter movements into California. No clearly cyclic tendencies can be discerned:

1965-66 - small to moderate numbers south to Monterey Bay; none to southern California

1966-67 - "average" numbers south to Monterey Bay; none to southern California

1967-68 - very few to Monterey; none to southern California

1968-69 - moderate numbers to Monterey; moderate numbers to southern California

1969-70 - large numbers to Monterey; moderate numbers to southern California

1970-71 - very few records for California

1971-72 - moderate numbers to Monterey; "large flight" to southern California

Northern Fulmar (continued)

1972-73 - scarce at Monterey; none to southern California

1973-74 - no large numbers anywhere, but recorded in small numbers south to central Baja California

1974-75 - few records for California

From the above, it may be said that the winters of 1968-69, 1969-70 and 1971-72 were fulmar flight years, 1966-67 and 1973-74 were average and the other five winters were poor fulmar years.

At least three subspecies and numerous color phases of the Northern Fulmar have been distinguished, the variations in color of the Pacific subspecies, _F. g. rodgersii_, being most pronounced. The palest of these birds are entirely white, with small amounts of black mottling in the wings; the darkest forms are entirely dark gray. Between these two extremes nearly every intermediate pattern exists. Palmer (1962) notes that the light morph comprises an increasing proportion of breeding populations in more northerly colonies, culminating in all-light populations at Hall and St. Matthew Islands at the northern limit of the fulmar nesting range. All color phases occur in southern California with the dark phase predominating (at least early in the season). The relation, if any, of color to distribution is as yet unclear.

Fulmars generally remain well offshore, feeding on a variety of fish, fish offal, molluscs, crustaceans, polychaetes, carrion, and jellyfish (Fisher 1952, Palmer 1962). Anthony (1898) reported them as feeding exclusively on these last organisms off the southern California coast. Vegetable matter is also picked and swallowed at nest sites, although not as food (Palmer 1962).

Northern Fulmar (continued)

1975-76 Baseline Data

April - September 1975. None recorded.

October 1975. There was one record of a light-phase bird 20 km south-southwest of San Miguel Is.

November 1975. Several at-sea sightings of single birds or pairs were made throughout the Southern California Bight (Fig. III-A4-255). They were concentrated in the Osborn Bank area, around Santa Barbara and San Nicolas Islands, and in the Fortymile Bank/Coronado Escarpment region.

December 1975. The numbers of Northern Fulmars increased noticeably during this month (Fig. III-A4-256). Ship surveys from 15-20 Dec. revealed the highest densities south of San Miguel Is., near Tanner and Cortés Banks, and in the region between San Clemente Is. and the Mexican border.

January 1976. Fulmars were seen throughout the month as determined by both ship and aerial surveys (Figs. III-A4-257, 258). In early January, birds were present in low density near Tanner and Cortés Banks, between San Clemente Is. and San Diego, and off Pt. Vicente. Later in the month, large concentrations of birds were found from Rodriguez to San Juan Seamounts, in Santa Barbara Channel, around Santa Rosa Is., and along the northern Santa Rosa-Cortés Ridge (to 12.9/km^2). Several large feeding flocks of Common Murres, California Gulls, cormorants and about 1,000 Northern Fulmars were photographed from the air in Santa Barbara Channel, 20 km south of Santa Barbara (in addition to birds within the regular transect areas).

February 1976. The species' distribution in February was similar to that of January, but numbers were somewhat reduced (Fig. III-A4-259). Concentrations were centered along the Santa Rosa-Cortés Ridge, in the

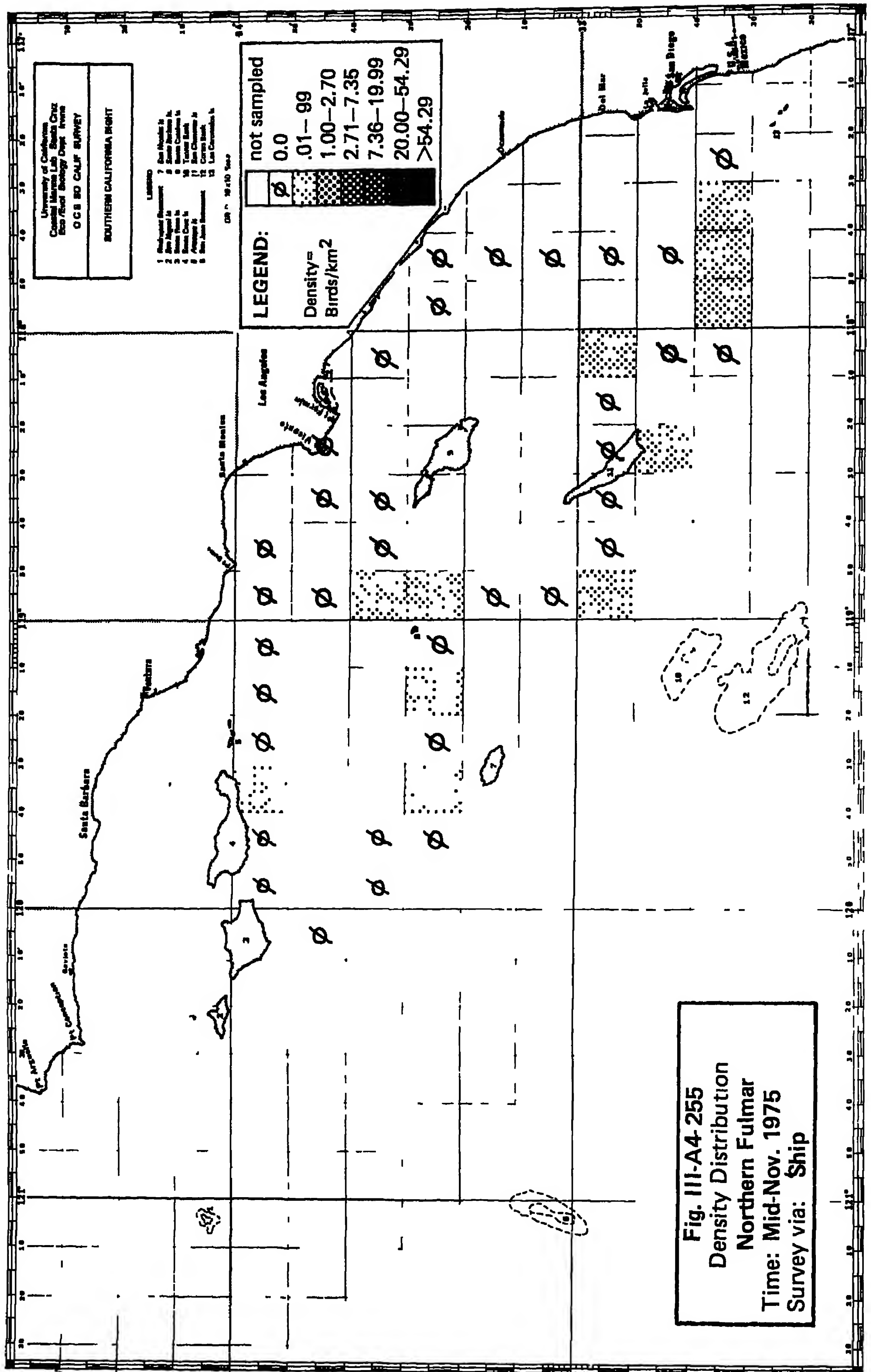


Fig. III-A4-255
Density Distribution
Northern Fulmar
Time: Mid-Nov. 1975
Survey via: Ship

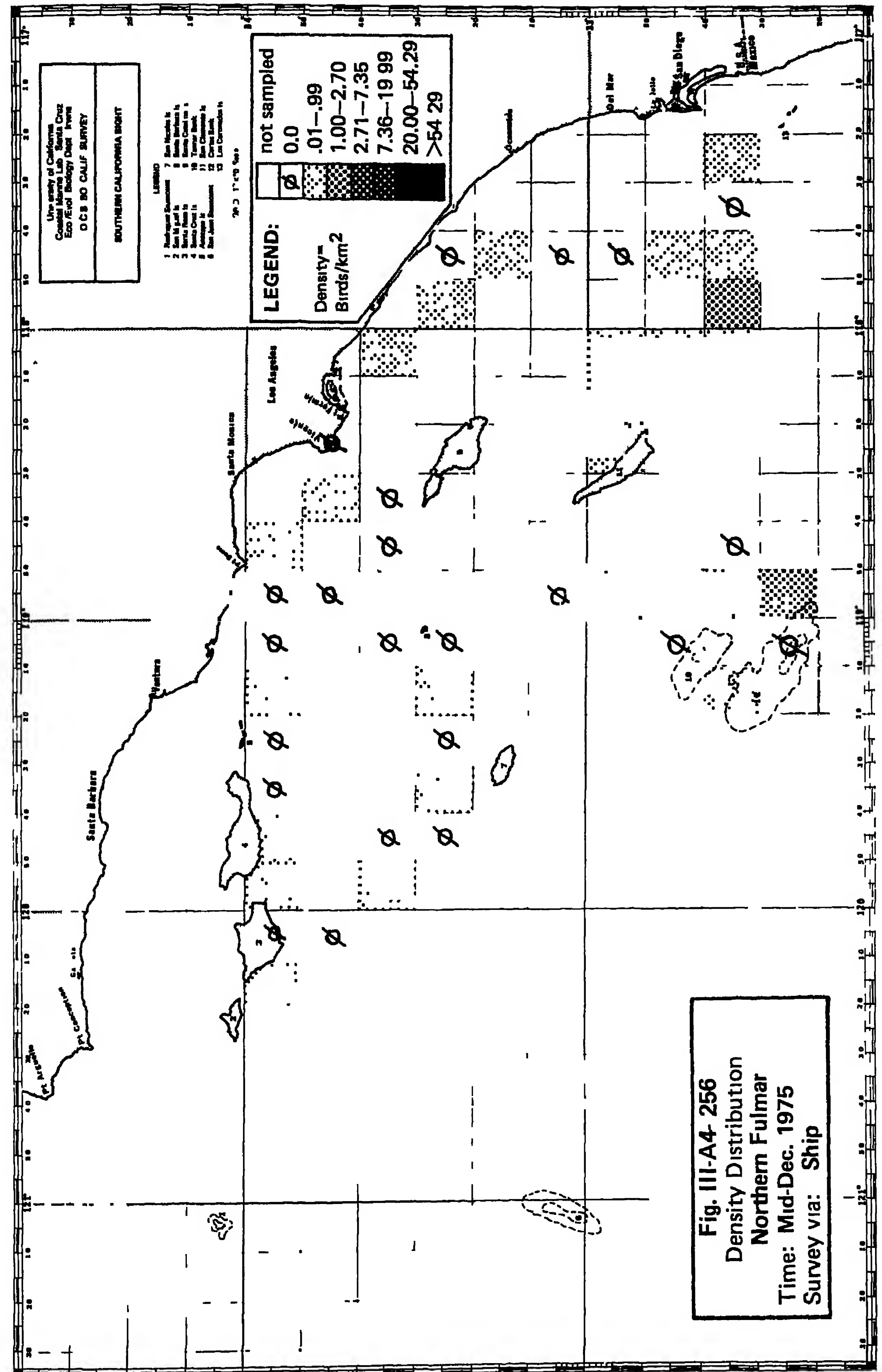


Fig. III-A4-256
Density Distribution
Northern Fulmar
Time: Mid-Dec. 1975
Survey via: Ship

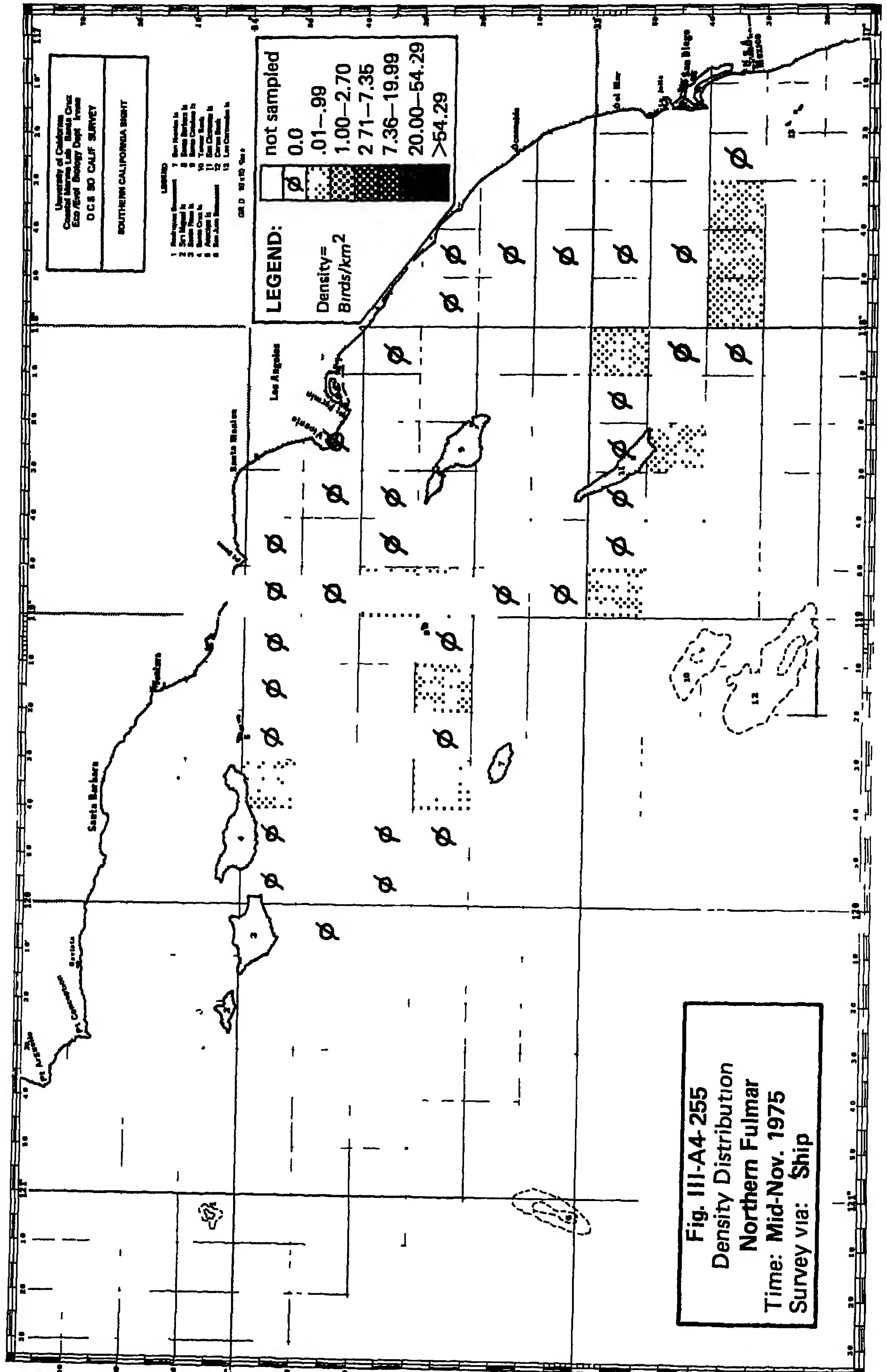


Fig. III-A4-255
Density Distribution
Northern Fulmar
Time: Mid-Nov. 1975
Survey via: Ship

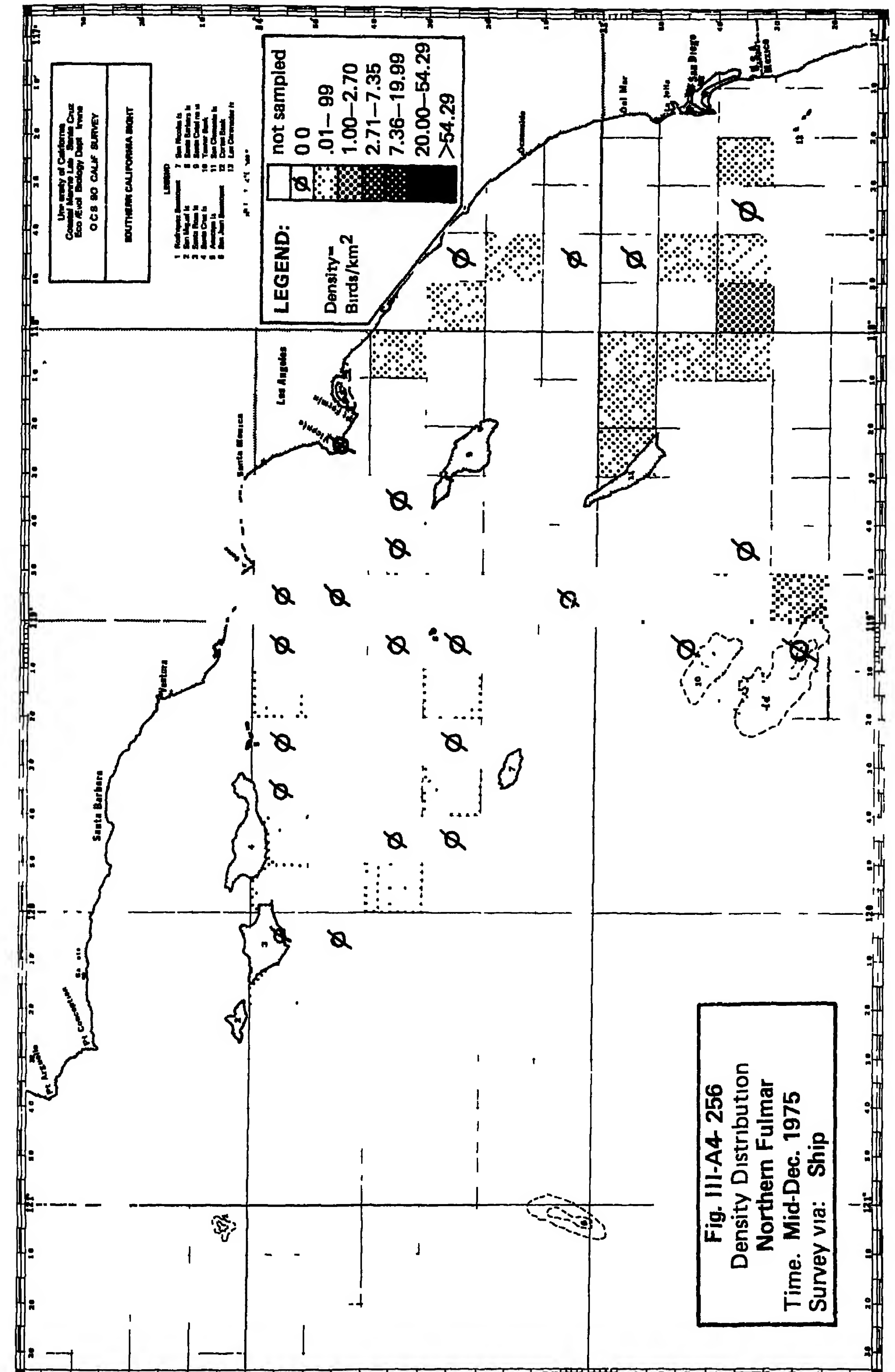


Fig. III-A4-256
Density Distribution
Northern Fulmar
Time: Mid-Dec. 1975
Survey via: Ship

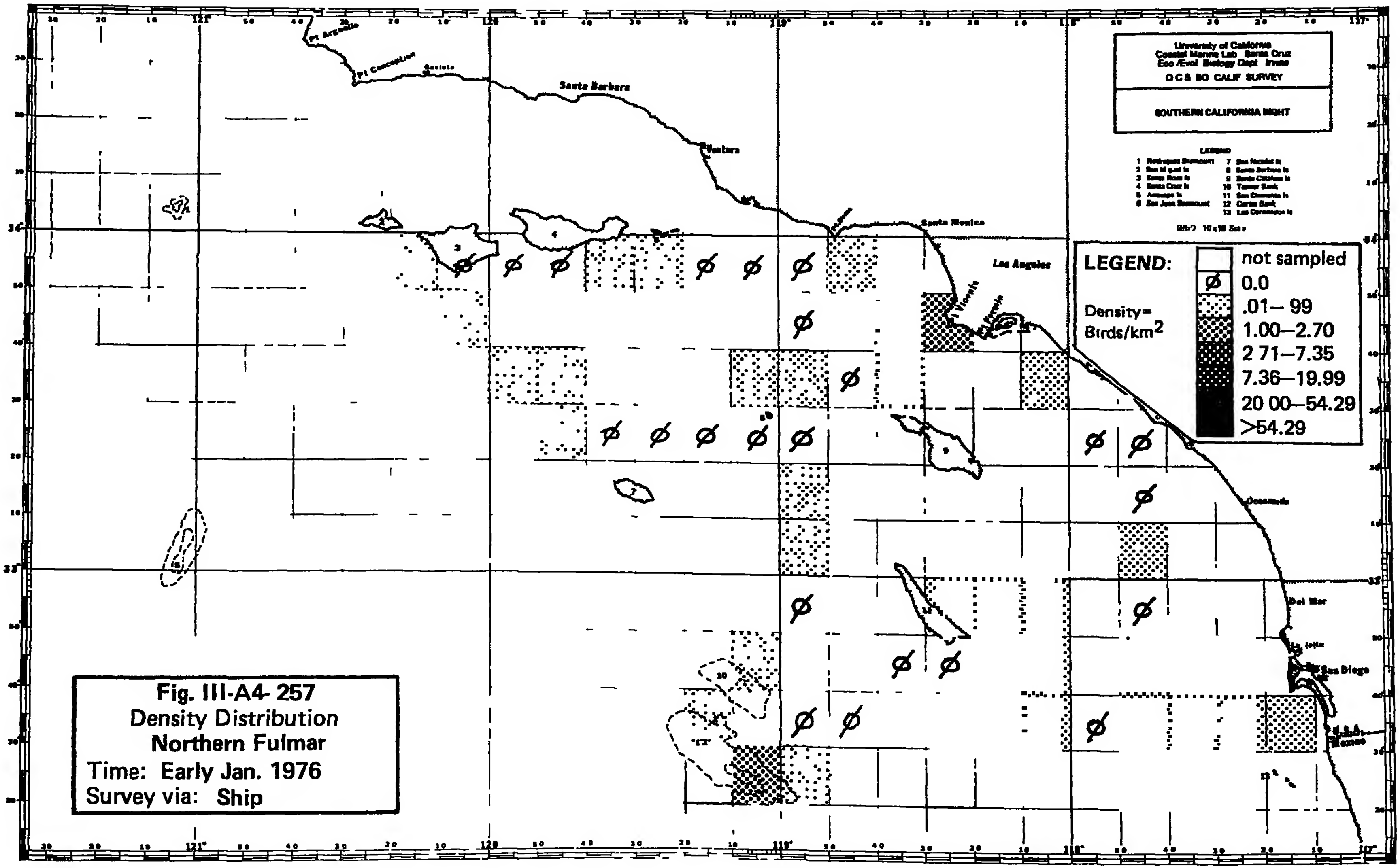
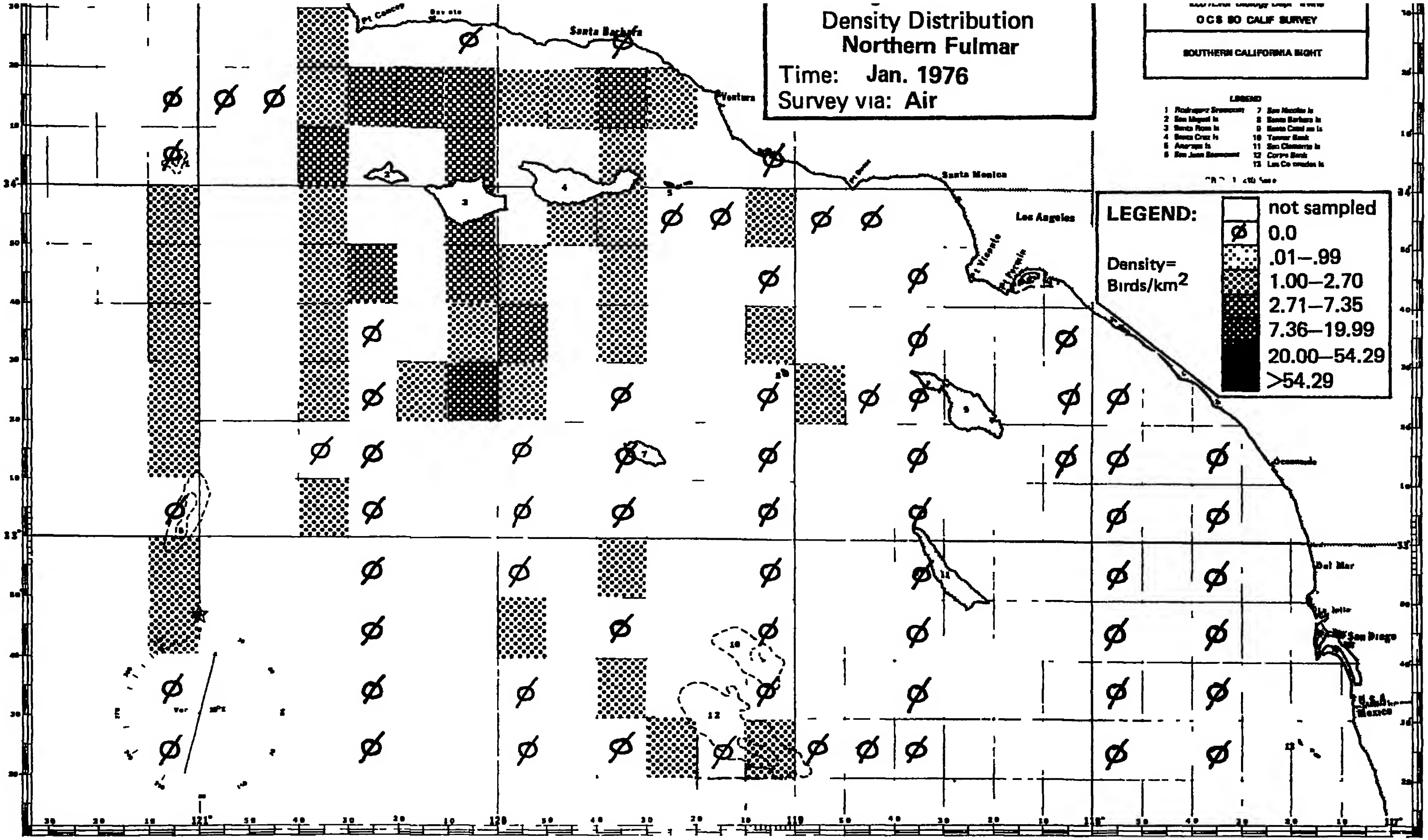


Fig. III-A4- 257
Density Distribution
Northern Fulmar
Time: Early Jan. 1976
Survey via: Ship


Density Distribution
Northern Fulmar
Time: Jan. 1976
Survey via: Air
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Santa Barbara
Ventura
Santa Monica
Los Angeles
Del Mar
San Diego
Mexico

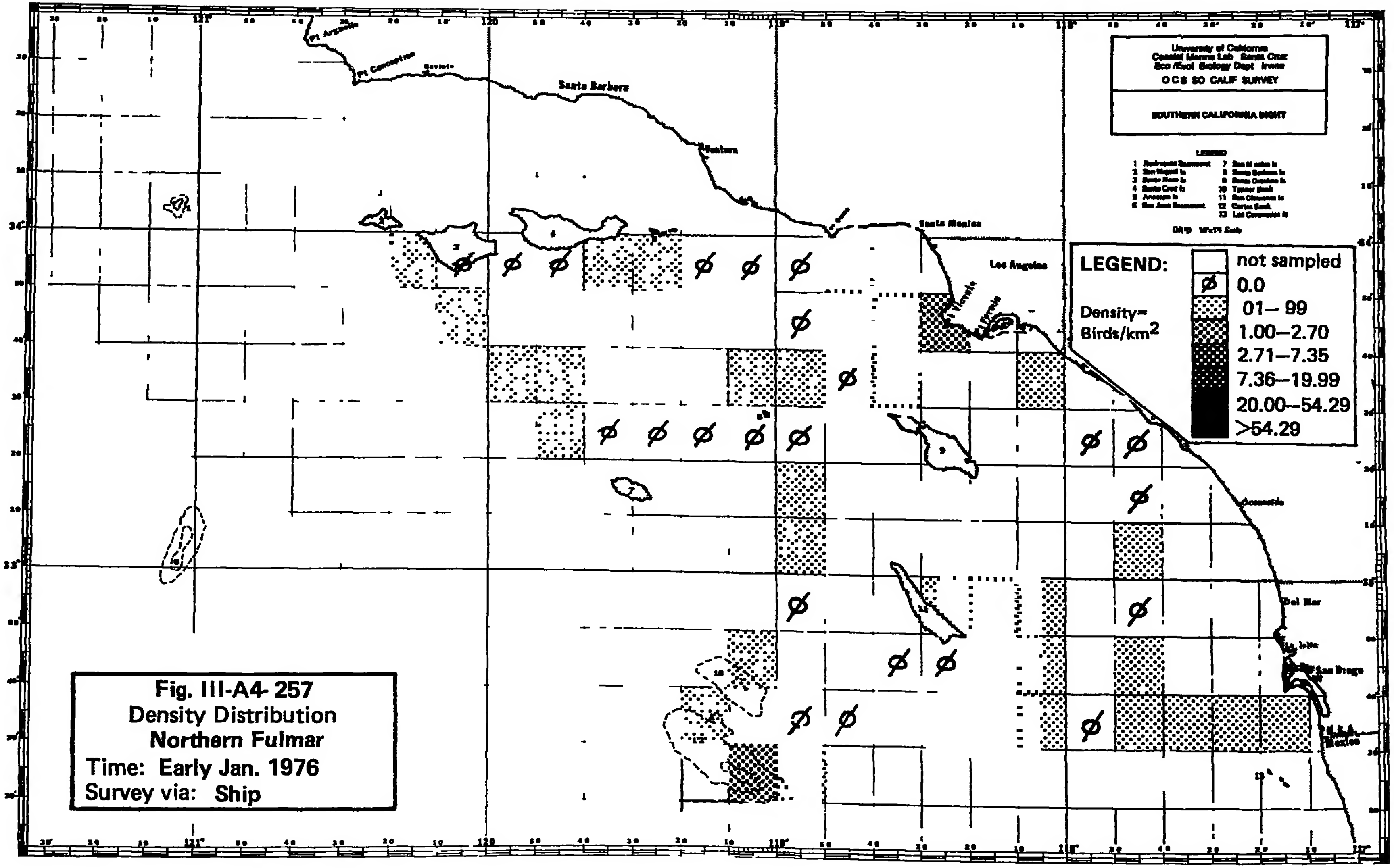
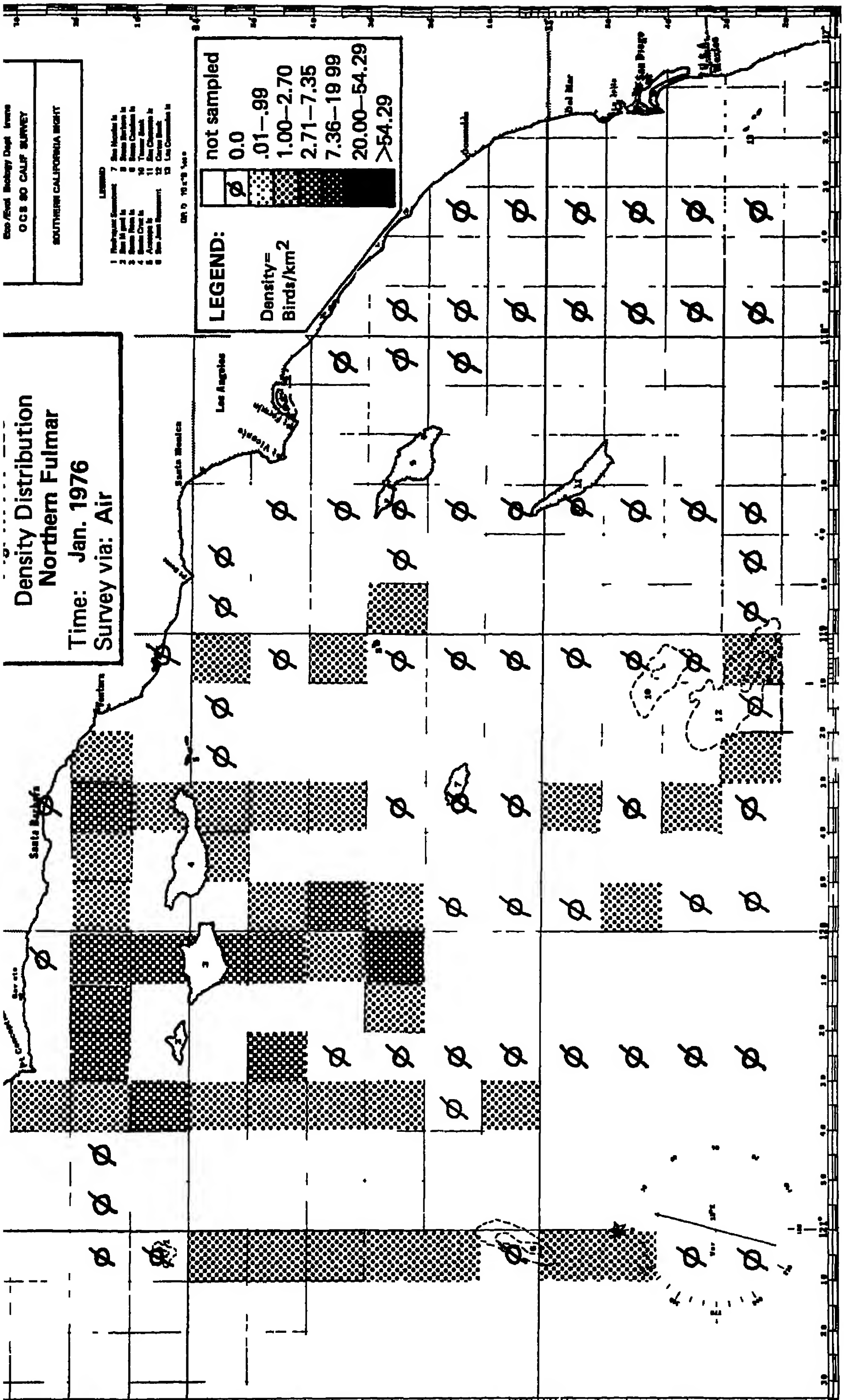


Fig. III-A4- 257
Density Distribution
Northern Fulmar
Time: Early Jan. 1976
Survey via: Ship


Density Distribution
Northern Fulmar
Time: Jan. 1976
Survey via: Air
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Los Angeles
Santa Monica
Santa Barbara
San Diego
Del Mar
La Jolla
U.S.A.
Mexico

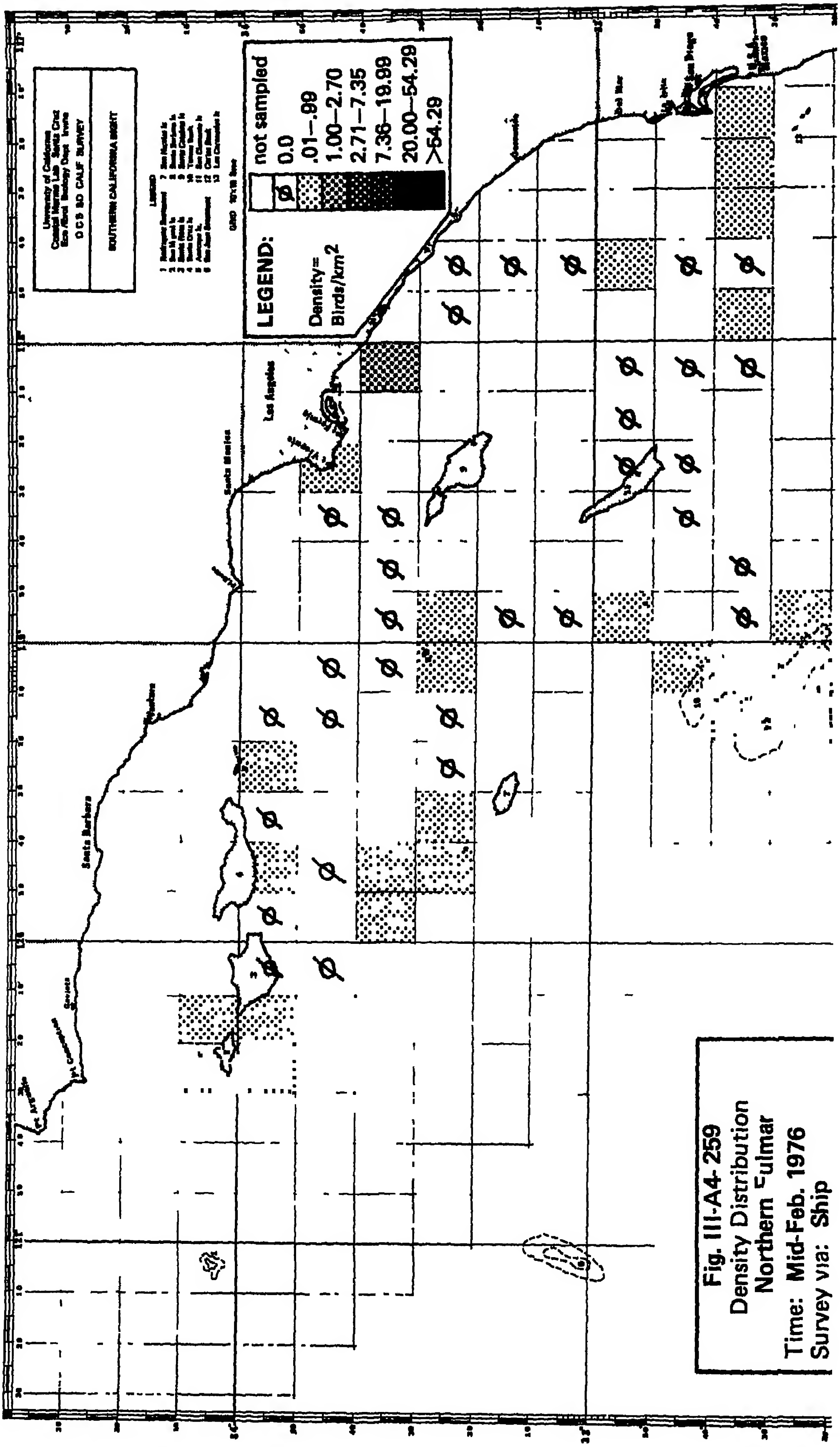


Fig. III-A4-259
Density Distribution
Northern Fulmar
Time: Mid-Feb. 1976
Survey via: Ship

Northern Fulmar (continued)

Pt. Vicente/Newport Beach area, and between Fortymile Bank and the Coronado Escarpment. Moderate numbers were also seen near Tanner and Cortés Banks and inshore of the northern Channel Islands (especially Santa Rosa and San Miguel Islands).

March 1976. Fulmars were again common (Fig. III-A4-260). Highest densities were recorded off Pt. Arguello ($17+/km^2$) and 45 km east of San Juan Seamount ($10.75/km^2$). Density was generally high in the vicinity of the northern islands, between Santa Catalina and San Clemente Islands and near Tanner and Cortés Banks.

A flock of 15 was seen in Chinese Harbor, Santa Cruz Is., feeding on a mass of jellyfish.

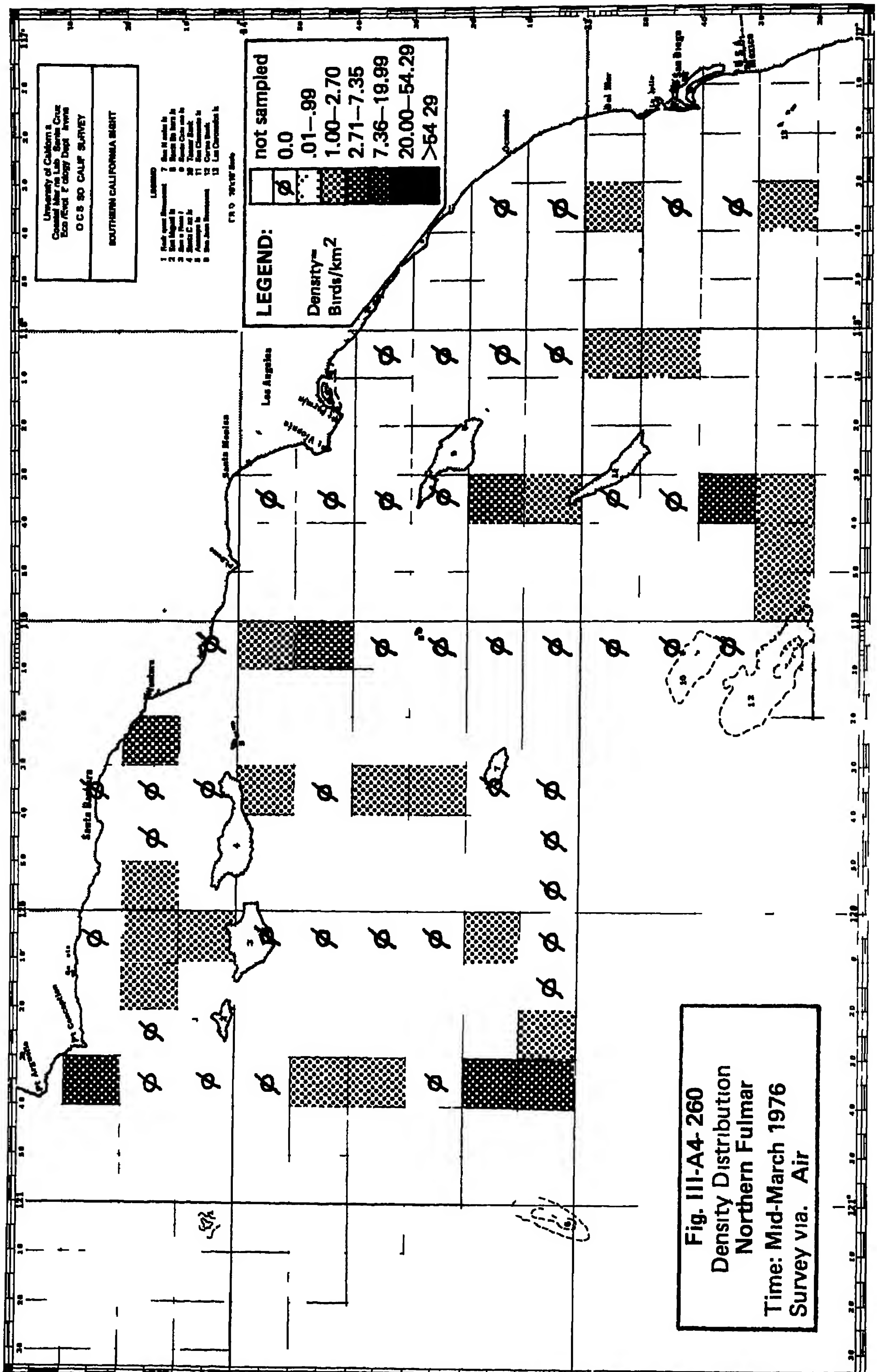


Fig. III-A4-260
Density Distribution
Northern Fulmar
Time: Mid-March 1976
Survey via. Air

Pink-footed Shearwater (Puffinus creatopus)

This bird is known to breed only on the Juan Fernandez and Santa Clara Islands off the coast of Chile, near the southern subtropical convergence, migrating to analogous areas in the eastern North Pacific for the austral fall and winter. Except that the species seems restricted to the eastern Pacific, neither migration routes nor times are very well known. Most California records come from latitudes south of San Francisco, but these shearwaters have been seen as far north as Forrester Island in southeastern Alaska (Bent 1922, Palmer 1962).

Pink-footed Shearwaters are present in southern California waters in all seasons, although their numbers are generally greater in the summer (Howell 1917, Grinnell and Miller 1944, Scott 1974, Small 1974) and much reduced in winter.

Relatively little is known of the habits of this shearwater. Authors even disagree as to whether the species' preferred habitat is offshore or inshore, in cold or warm waters (Palmer 1962, Pyle and DeLong 1968 ms, Scott 1974). Its distribution at sea is often scattered, but it does congregate in productive feeding areas (Palmer 1962).

The Pink-footed Shearwater is accorded specific rank by most authors (Bent 1922, A.O.U. 1957, Peterson 1961, Small 1974), but Palmer (1962) regards it as the light-phase, South American subspecies of the Flesh-footed Shearwater, P. carneipes.

Fish and squid (Loligo) are the species' primary prey (Palmer 1962).

Pink-footed Shearwater (continued)

1975-76 Baseline Data

April 1975. This species was uncommon along the ship survey lines followed this month. One bird was seen close inshore near Cluster Pt., Santa Rosa Is.; two were encountered over the Santa Cruz Basin. Their numbers were slightly higher between Santa Barbara Is. and San Pedro, with six birds recorded west of longitude 118°35'W and ten birds east of this line. The usual ratio of Sooty to Pink-footed Shearwaters was reversed in the latter area, with Pink-footed Shearwaters becoming common while Sooty Shearwaters were absent altogether.

May 1975. Pink-footed Shearwaters were generally uncommon. They were most often seen singly or in small groups of two to five birds. They were vastly outnumbered by hundreds of Sooty Shearwaters in the vicinity of Santa Cruz Passage, with only three Pink-footed Shearwaters sighted, in Santa Cruz Basin (5-6 birds) and between Santa Barbara and Santa Catalina Islands (10 birds). They were also recorded in the area south of San Clemente Is. (Fig. III-A4-261). The species was most common 10-15 km north of Santa Catalina Is.

June 1975. The number of Pink-footed Shearwaters increased. They were common in the vicinity of Pt. Vicente and from there to Anacapa Is.; four birds were sighted just south of Santa Rosa Is., and flocks of 20+ birds were encountered by shipboard observers over the northern Santa Rosa-Cortés Ridge, up to 87 km northwest of San Nicolas Is. Aerial surveys from 27 through 30 June (Fig. III-A4-262) showed moderately high densities in the Santa Barbara Channel, and also 20-40 km south of Santa Rosa Is. The highest densities (53.8/km^2) were recorded over the San Nicolas Basin, 20-30 km north of Tanner Bank, where Pink-footed

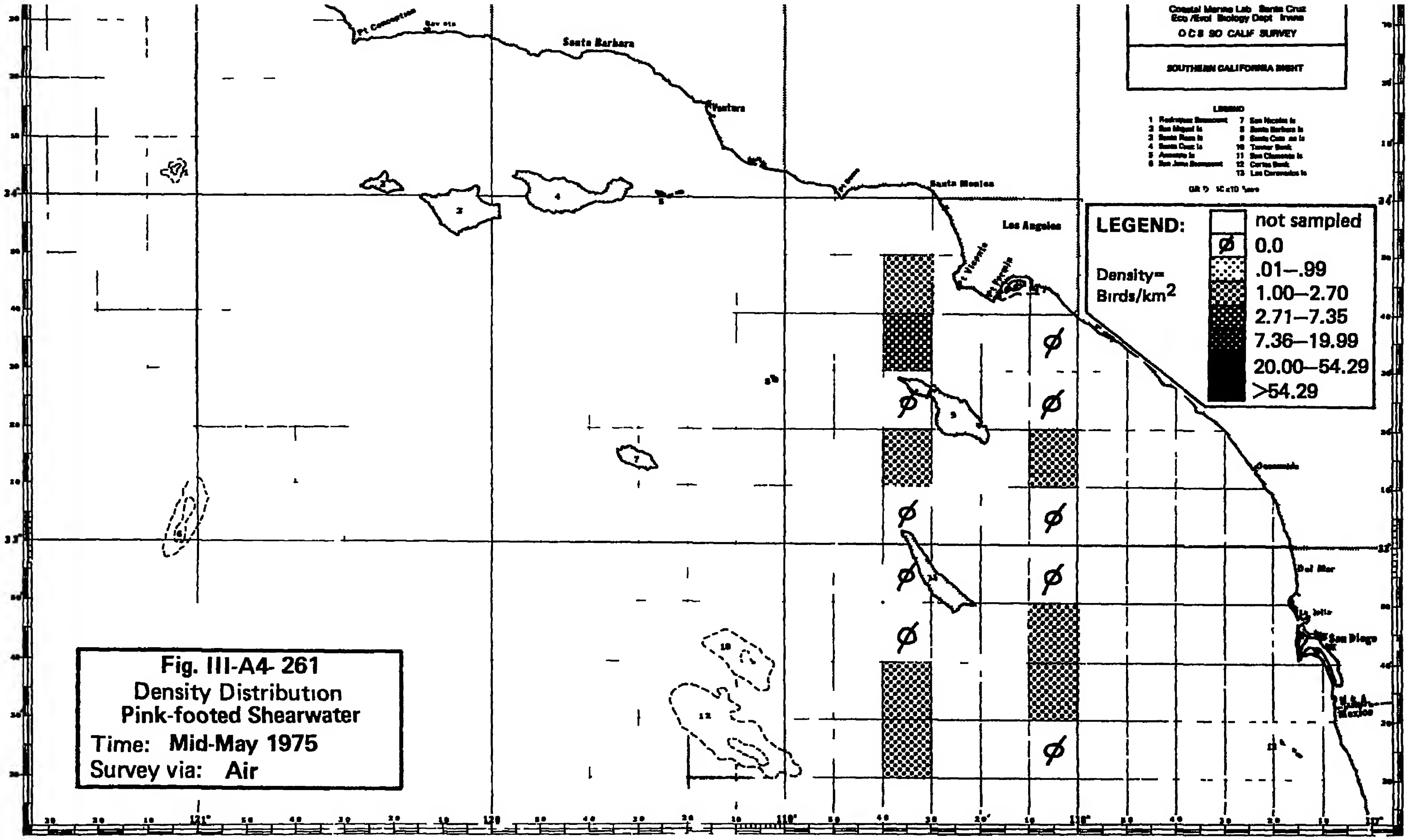


Fig. III-A4- 261
Density Distribution
Pink-footed Shearwater
Time: Mid-May 1975
Survey via: Air

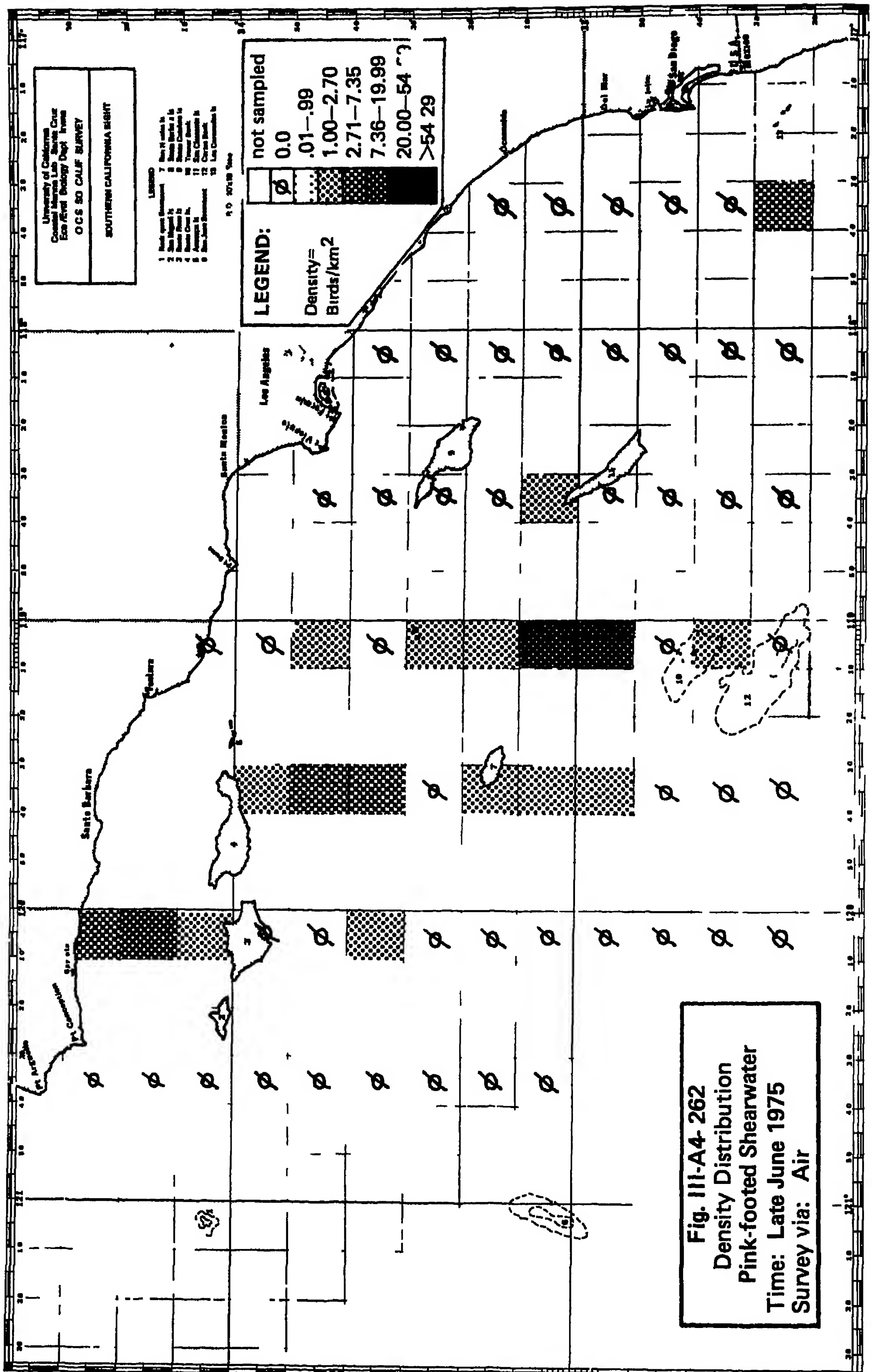


Fig. III-A4-262
Density Distribution
Pink-footed Shearwater
Time: Late June 1975
Survey via: Air

Pink-footed Shearwaters (continued)

Shearwaters outnumbered Sooty Shearwaters by almost two to one. Shearwaters accounted for 94.7% of all birds recorded in that area.

July 1975. There was a general increase in the number of sightings and the number of birds per sighting for Pink-footed Shearwaters (total shipboard sightings = 121; total birds = 240). The species was common throughout the study area, especially over the Santa Cruz Basin and in the regions 10-40 km west of San Clemente Is., and 45 km west of the Mexican border (Coronado Escarpment area). The highest number of birds (34 in five sightings) was encountered about 30 km southeast of Santa Barbara Is. (Fig. III-A4-263). We have no aerial data for this month.

August 1975. Moderate densities of Pink-footed Shearwaters were noted south of Pt. Arguello and along a line from Santa Rosa to San Nicolas Islands during this month's aerial surveys (4-7 August). Late in the month (24-30 August), shipboard observers recorded the presence of these shearwaters in moderate numbers throughout the Bight (Figs. III-A4-264, 264a) especially off Pt. Vicente and Pt. Dume, between Santa Monica Bay and the northern Channel Islands, along the Santa Rosa-Cortes Ridge and in the vicinity of the Coronado Escarpment west of the Mexican border. A concentration of unidentified shearwaters (68-82 birds/km^2), most likely a mixture of Sooty and Pink-footed Shearwaters in an undetermined ratio, was also recorded 18-27 km north of Tanner Bank.

September 1975. Most sightings were of single birds or small groups; sightings of 10 to 20 birds at a time were made around San Miguel Is. on 9 September where large numbers of feeding Sooty Shearwaters were also found (500+ birds in all). The species was also common along the Santa Rosa-Cortés Ridge (Fig. III-A4-265). At month's end (22-27 Sept.),

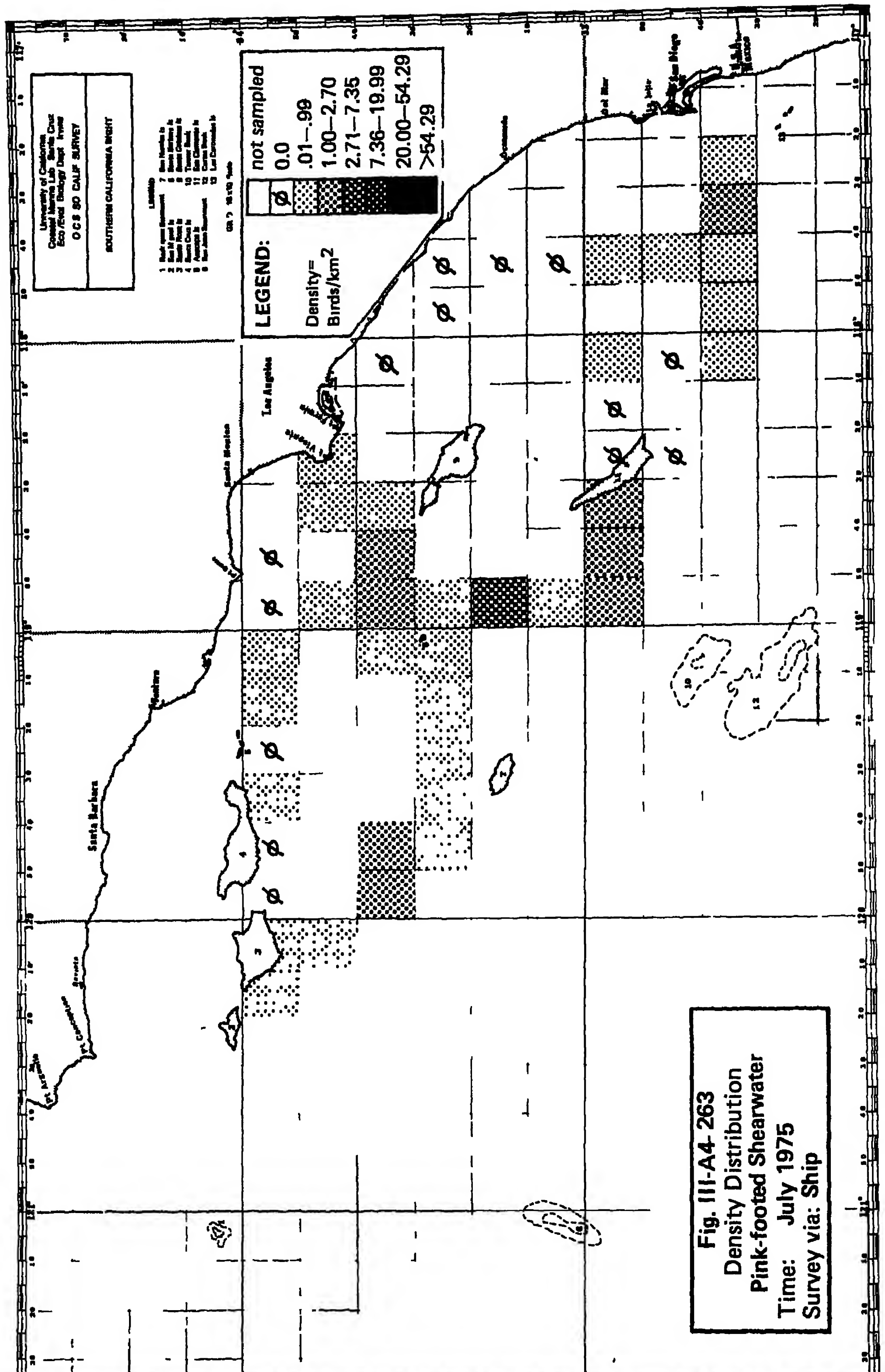


Fig. III-A4-263
Density Distribution
Pink-footed Shearwater
Time: July 1975
Survey via: Ship

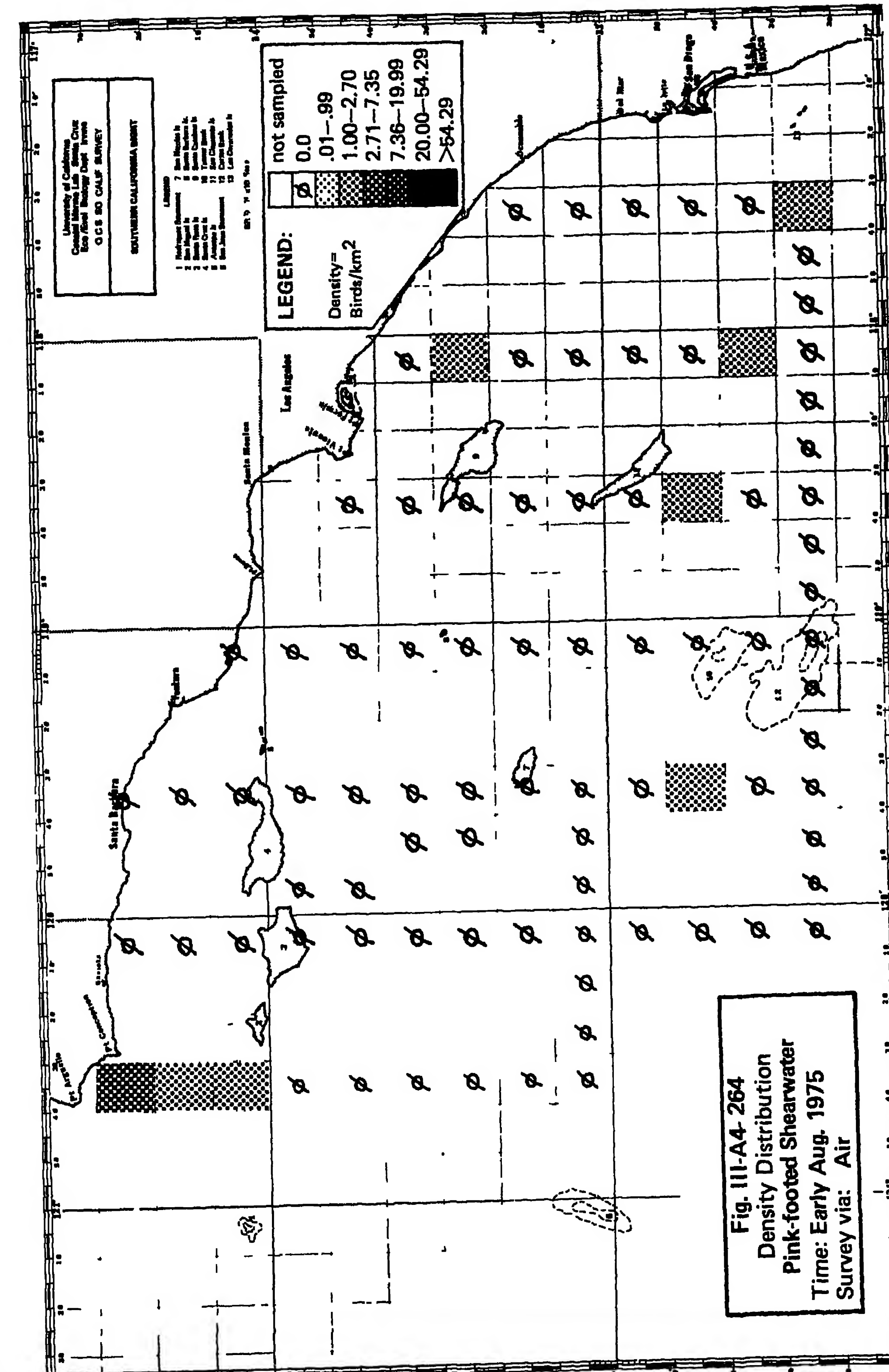


Fig. III-A4-264
Density Distribution
Pink-footed Shearwater
Time: Early Aug. 1975
Survey via: Air

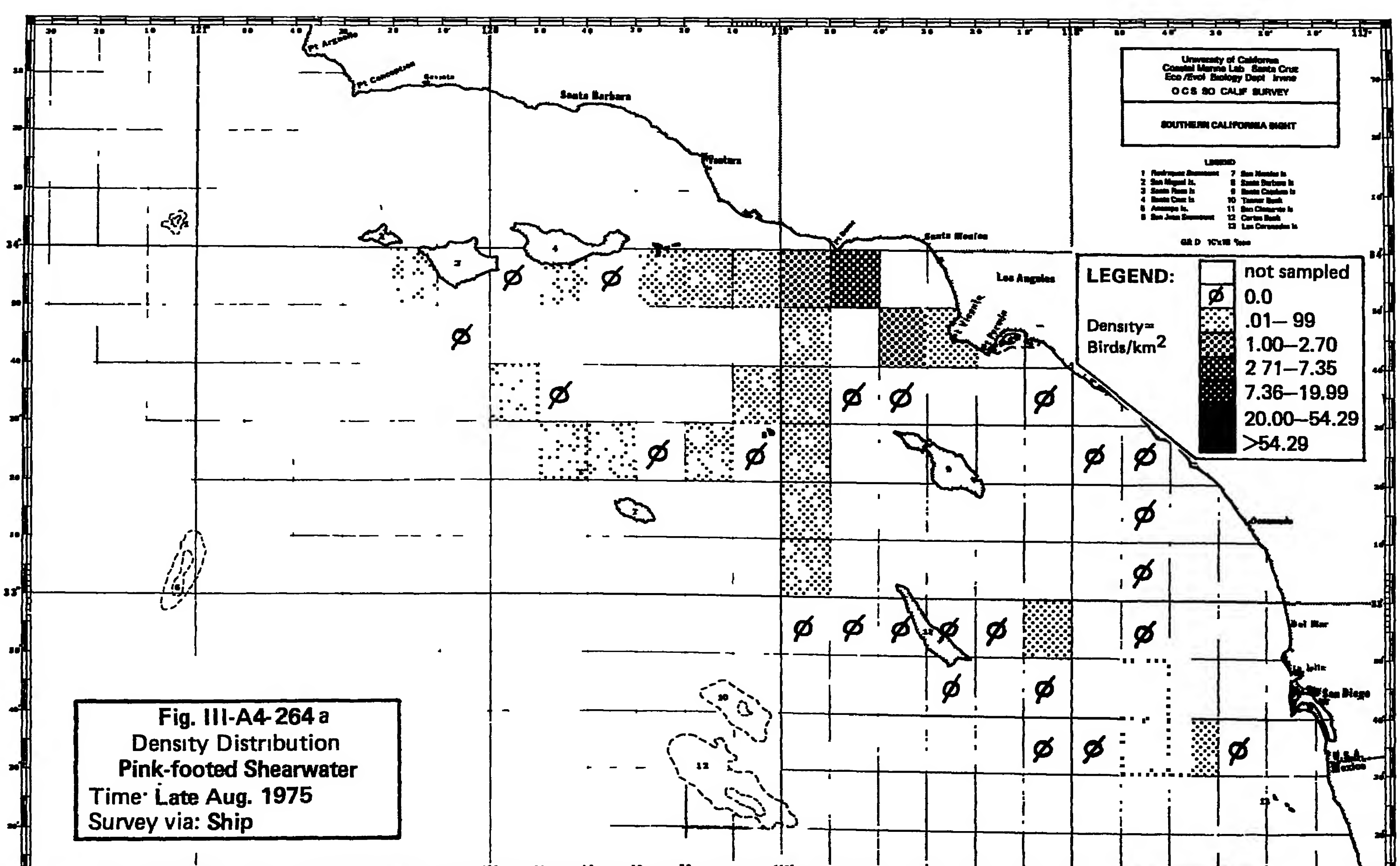


Fig. III-A4-264 a
Density Distribution
Pink-footed Shearwater
Time: Late Aug. 1975
Survey via: Ship

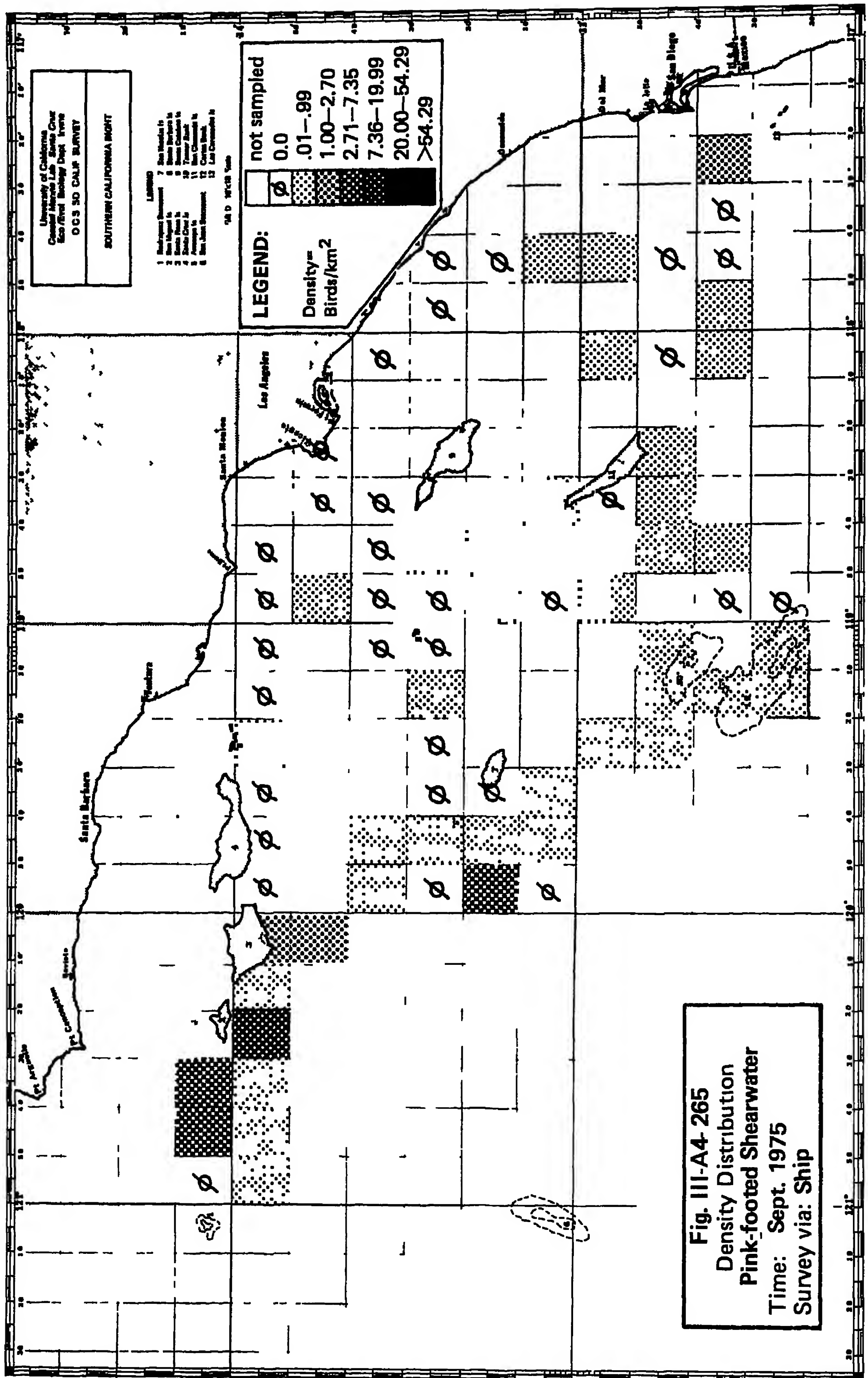


Fig. III-A4-265
Density Distribution
Pink-footed Shearwater
Time: Sept. 1975
Survey via: Ship

when Sooty Shearwaters were primarily concentrated in the northwest portion of the Bight, moderate numbers of Pink-footed Shearwaters were still to be found over the Coronado Escarpment and in the area east of longitude 119°W. Analysis of the available data on direction of movement for this month and for the month of July did not reveal any predominant patterns. In contrast, Sooty Shearwaters were clearly moving toward the vicinity of San Miguel Is. at this time.

October 1975. The number of Pink-footed Shearwaters seen this month (aerial survey from 23-26 October) dropped sharply. A single bird was seen 19 km southwest of San Miguel Is., two birds were located 65 km north of San Nicolas Is., a fourth was seen 22-28 km south of San Nicolas Is., and a fifth was encountered over Tanner Bank.

November 1975. None recorded.

December 1975. One bird was seen in the vicinity of San Miguel Passage, another about 50 km southeast of Tanner Bank, and the third 40 km due west of San Diego, from the 17th to the 20th.

January 1976. There were seven aerial sightings of this shearwater, six of them west of longitude 119°W (Fig. III-A4-266). Birds were seen more frequently well offshore, from 10 to 20 km southwest of San Miguel Is. Single birds were also seen about 15 km west of Ventura, 32 km north of San Nicolas Is. and 18 km west of Newport Beach.

February 1976. One bird was sighted at the southern end of Santa Cruz Passage on 11 February.

March 1976. Five single birds were seen in aerial surveys from the 12th to the 14th. One was sighted 18 km southwest of San Miguel Is., two others 42.5 km southwest of San Nicolas Is., one over Tanner Bank, and

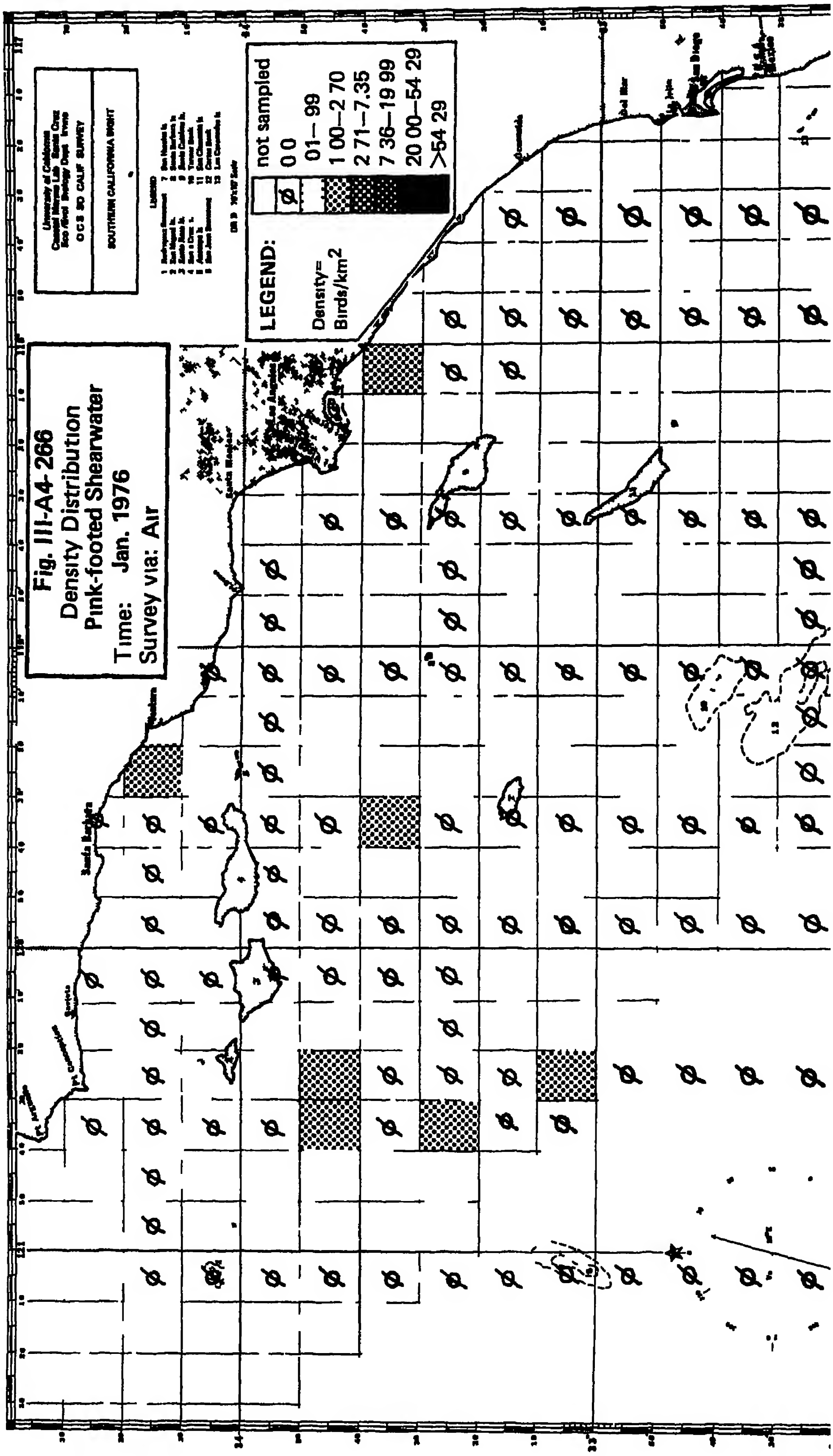


Fig. III-A4-266
Density Distribution
Pink-footed Shearwater
Time: Jan. 1976
Survey via: Air

Pink-footed Shearwater (continued)

one in the Gulf of Santa Catalina (Fig. III-A4-266a).

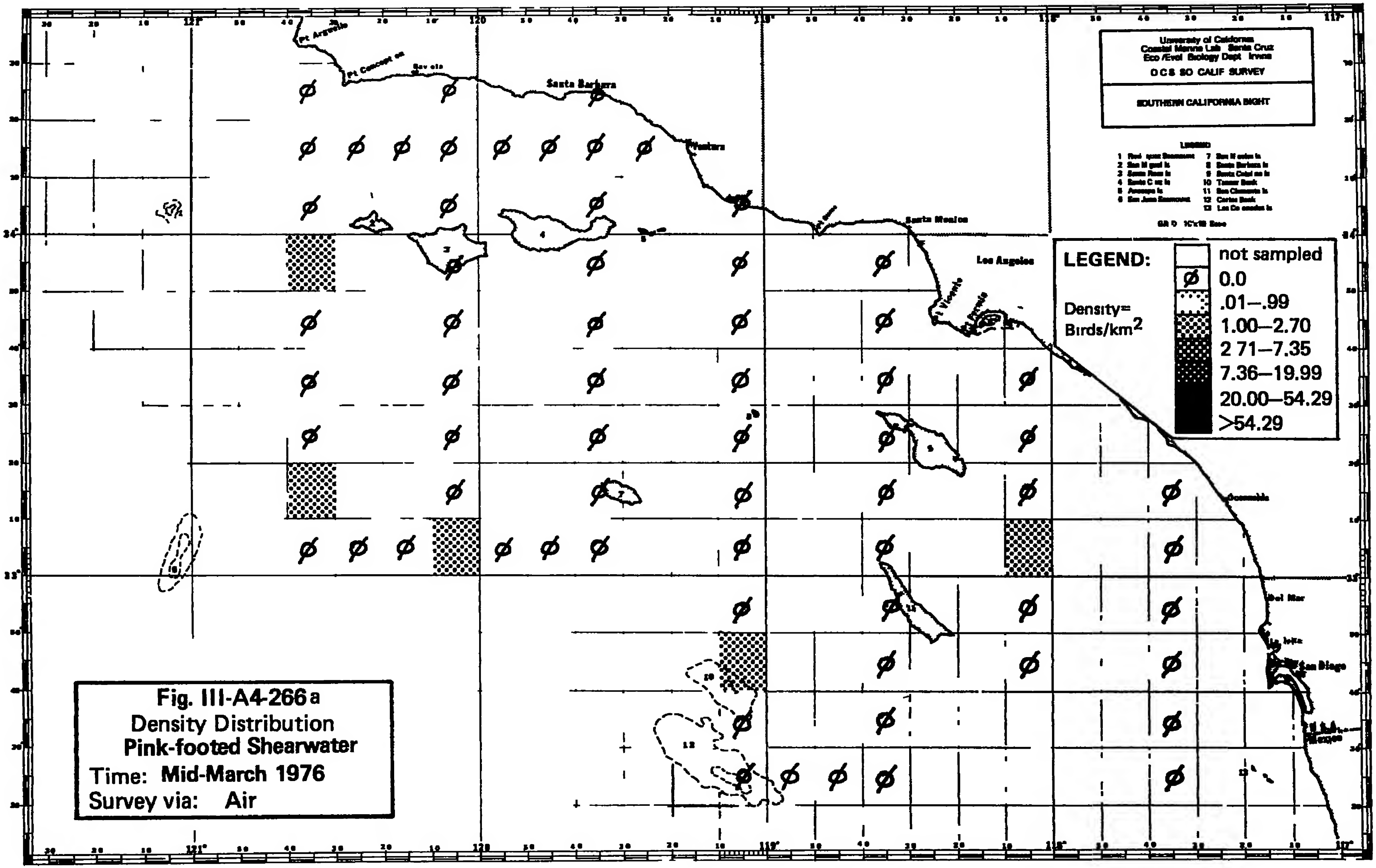


Fig. III-A4-266a
Density Distribution
Pink-footed Shearwater
Time: Mid-March 1976
Survey via: Air

Flesh-footed Shearwater (Puffinus carneipes)

From its nesting grounds on islands off Australia and New Zealand, the Flesh-footed Shearwater is a rare visitor to the eastern Pacific coast. Like several other shearwater species, it leaves the nesting area in late April and May and undertakes a clockwise, transequatorial migration around the Pacific. Some Australian populations remain in the southern oceans during the non-breeding season.

The Flesh-footed Shearwater is found irregularly in southern California waters and usually occurs offshore singly or among flocks of the more abundant Sooty and Pink-footed Shearwaters (Grinnell and Miller 1944, Palmer 1962, Scott 1974). There are scattered records for this species throughout the Bight and from Ventura to San Diego (McCaskie 1968-1971, 1973-75, Jehl 1973b).

The Flesh-footed and Pink-footed Shearwaters are generally accorded specific rank (see A.O.U. 1957), but others (see Palmer 1962) regard them as the dark- and light-phase forms, respectively, of a single polymorphic species, Puffinus carneipes. The former is then P. c. carneipes and the latter P. c. creatopus.

Not much is known of the feeding habits of this species, although small crustaceans, fish and cephalopods probably form the bulk of its diet (Palmer 1962). It has been reported in association with feeding flocks of pelicans, gulls and other shearwaters (Jehl 1973b).

1975-76 Baseline Data

One record, see Volume III, p. III-592.

New Zealand Shearwater (*Puffinus bulleri*)

The New Zealand Shearwater nests in large colonies in northern New Zealand. It is present on its breeding grounds from mid-July to March. Birds of this species have been collected in Chilean waters in February-March, from waters off Japan in July and off California in autumn. These shearwaters are probably transequatorial migrants which follow a route similar to that of the New Zealand populations of Sooty Shearwaters in the Pacific, but virtually nothing is known of their movements. They seem to be restricted in range to the immediate vicinity of subtropical convergences, well offshore (Palmer 1962).

The species is an uncommon and irregular visitor to California waters, the largest numbers occurring in September-October near Monterey Bay (Grinnell and Miller 1944, Small 1974). South of this region, New Zealand Shearwaters become rare (Jehl 1973b, Bender et al. 1974), but, as in Monterey Bay, they are most likely to be seen in September and October. McCaskie (1969a, 1970b, 1971a) reports 175 birds off Ventura on 27 October 1968, one off San Diego in November 1969, and none at all between Port Hueneme and Anacapa Is. on 24 October 1970.

New Zealand Shearwaters are often found feeding in mixed flocks with Sooty and Pink-footed Shearwaters. What little information exists suggests they feed primarily on squid and small crustaceans (Palmer 1962).

1975-76 Baseline Data

April 1975. None recorded.

May 1975. On 16 May three birds of this species (and probably an additional two individuals) were seen from the air in the vicinity of the Coronado Escarpment. We are not aware of any other May sightings

New Zealand Shearwater (continued)

of this species from southern California waters.

June - August 1975. None recorded.

September 1975. One or two birds feeding in association with large flocks of Sooty and Pink-footed Shearwaters, one Dall porpoise, two Pacific white-sided dolphins and ten California sea lions were spotted 9 km south of Crook Pt., San Miguel Is. on 9 September. Shortly thereafter, two or three more birds, also feeding with Sooty and Pink-footed Shearwaters, were recorded 15 km southwest of Pt. Bennett. Another bird was seen flying 30 km west of San Miguel Is. on the same date.

October 1975 - March 1976. None recorded.

Sooty Shearwater (Puffinus griseus)

The Sooty Shearwater is a burrow-nester, breeding in large colonies on islands off the coasts of New Zealand and South America and in the Atlantic. During the non-breeding season, they migrate extensively over the northern and southern oceans. Generally considered a temperate-water species, it is most abundant over continental shelf areas which provide an excellent food source (Phillips 1963, Scott 1974). No subspecies have been distinguished, despite their cosmopolitan distribution.

With the onset of the austral winter, Sooty Shearwaters move northward to the temperate waters of both the Atlantic and Pacific Oceans, feeding in the offshore zones roughly between 30° and 50°N latitude (Palmer 1962). Their movements have been described by Bourne (1956) and reviewed by Phillips (1963), but neither the migration pathways nor the composition of the migrating groups is at all clear. This is particularly true of birds that travel to the North Pacific, since several breeding populations intermix in that area. Important northward migrations past Japan have been recorded in June and July (Austin and Kuroda 1953), and large numbers of birds are observed every year from April to November off the California coast, with peaks during May and September (Loomis 1900, 1918; Grinnell and Miller 1944; McCaskie 1970, 1972, 1974, 1975; Scott 1974; Small 1974).

In southern California, the Sooty Shearwater is seasonally the single most abundant seabird; counts of 100,000 birds in one sighting have been reported (Scott 1974). Pyle and DeLong (1968) observed large numbers in the fall of 1967 southwest of Pt. Conception, all headed southwestward in a steady stream 30-55 km wide at its origin. The species' status in the spring is as yet unclear; large numbers were found in this

same area in May 1967, but there was no evidence of any mass northward movement.

There are two current explanations for the double peak in numbers observed in southern California. Phillips (1963) contends both the spring and fall peaks represent migrations of South American birds to the North Pacific, with the southward-bound ranks bolstered by an unknown proportion of New Zealand birds following a circum-Pacific route similar to that of the Short-tailed Shearwater. Pyle and DeLong (1968 ms), however, found no evidence of direct movement between southern California waters and South America from EASTROPAC observations, although they do remark that a second migrating wave passed through the Southern California Bight in November which seemed to be headed south, rather than southwest. These authors suggest that in September, birds collect from all directions around the northwesternmost Channel Islands before heading *en masse* west and southwest for New Zealand. They contend the November wave was composed of immatures or other non-breeders, but the group may represent South American birds returning to their nesting grounds.

The Sooty Shearwater has been ranked as the single most important avian piscivore in the eastern North Pacific (Sanger 1972, Wiens and Scott 1975). It feeds primarily on squid, midwater schooling fish such as anchovy (*Engraulis mordax*) and sand lance (*Ammodytes tobianus*), as well as on crustaceans (Palmer 1962).

Sooty Shearwater (continued)

1975-76 Baseline Data

April 1975. Sooty Shearwaters were common to abundant along all the ship transects done from 19 through 21 April. Three hundred birds were recorded inshore near Cluster Pt., Santa Rosa Is. Sooty Shearwaters made up about half the birds sighted on a line between Santa Rosa and Santa Barbara Islands, and were especially common over Santa Cruz Basin. They were also common between Santa Barbara Is. and Pt. Fermin (12 birds in the first 27 km), although their numbers dropped to zero east of longitude 118°35'.

May 1975. Analysis of the numerous ship and aerial sightings shows this species was abundant throughout the study area (Fig. III-A4-267). Particularly high densities were found around the northern Channel Islands, where several flocks of 200-400 birds were observed to the north and west of San Miguel Is. near Castle Rk. and Richardson Rk. South of Santa Rosa and Santa Cruz Islands, especially in the vicinity of Santa Cruz Passage, Sooty Shearwaters accounted for the vast majority of bird sightings. They were also conspicuous over Santa Cruz Basin at the end of the month, although in lower numbers (e.g., 10 sightings and 143 birds 26 km north of San Nicolas Is. on 27 May). An aerial survey on 16 May, which covered the area east of 118°30' longitude, revealed very high densities (and again flocks of over 250 birds) in San Pedro Channel. Considerable numbers of birds were also sighted 18 km east of San Clemente Is. Closer to Newport Beach, there were large numbers of birds, but in smaller flocks (Fig. III-A4-268).

June 1975. Mid-month ship surveys from Los Angeles to Anacapa Is. and from San Miguel to San Nicolas Islands revealed large numbers south of

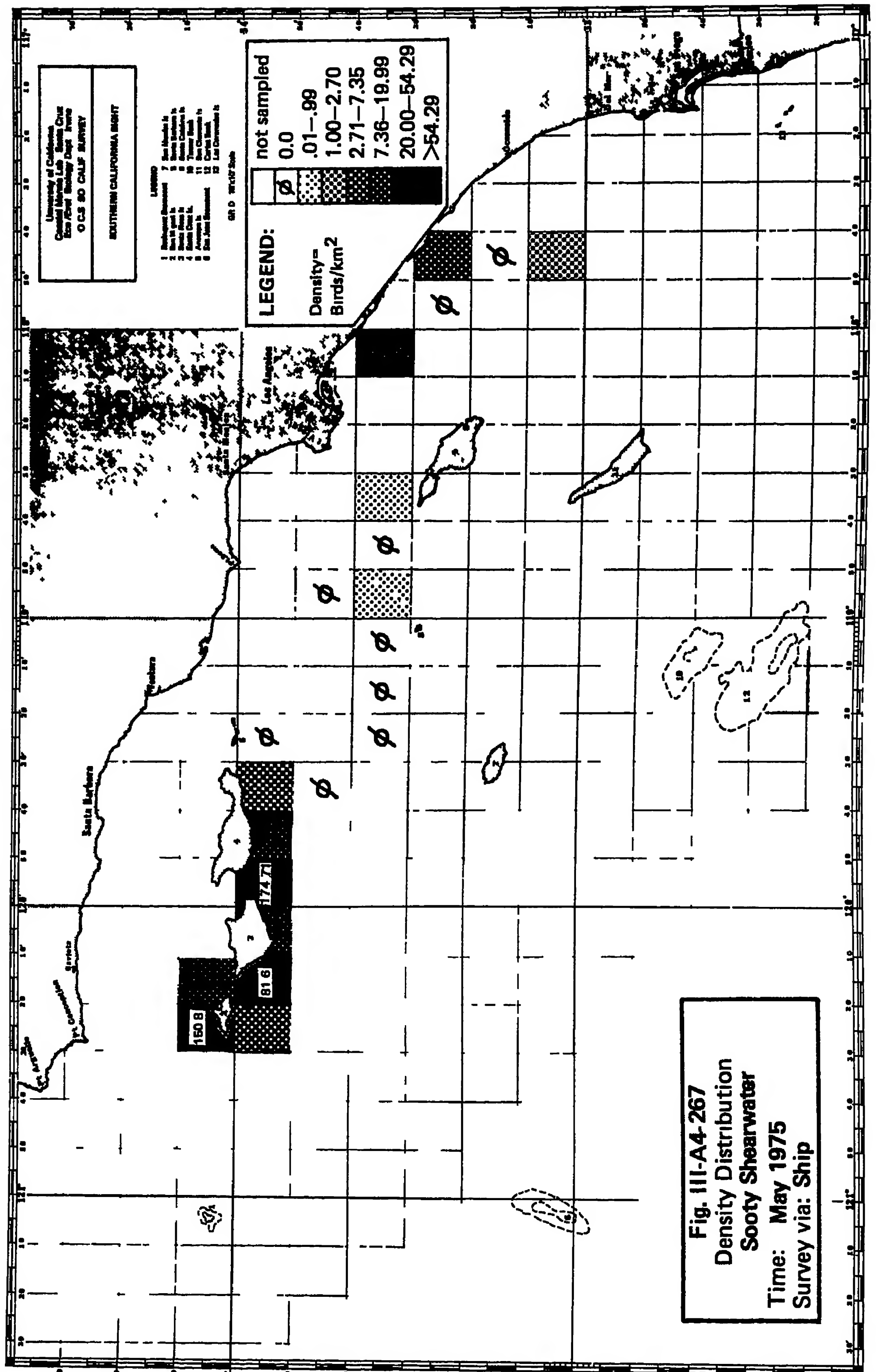


Fig. III-A4-267
Density Distribution
Sooty Shearwater
Time: May 1975
Survey via: Ship

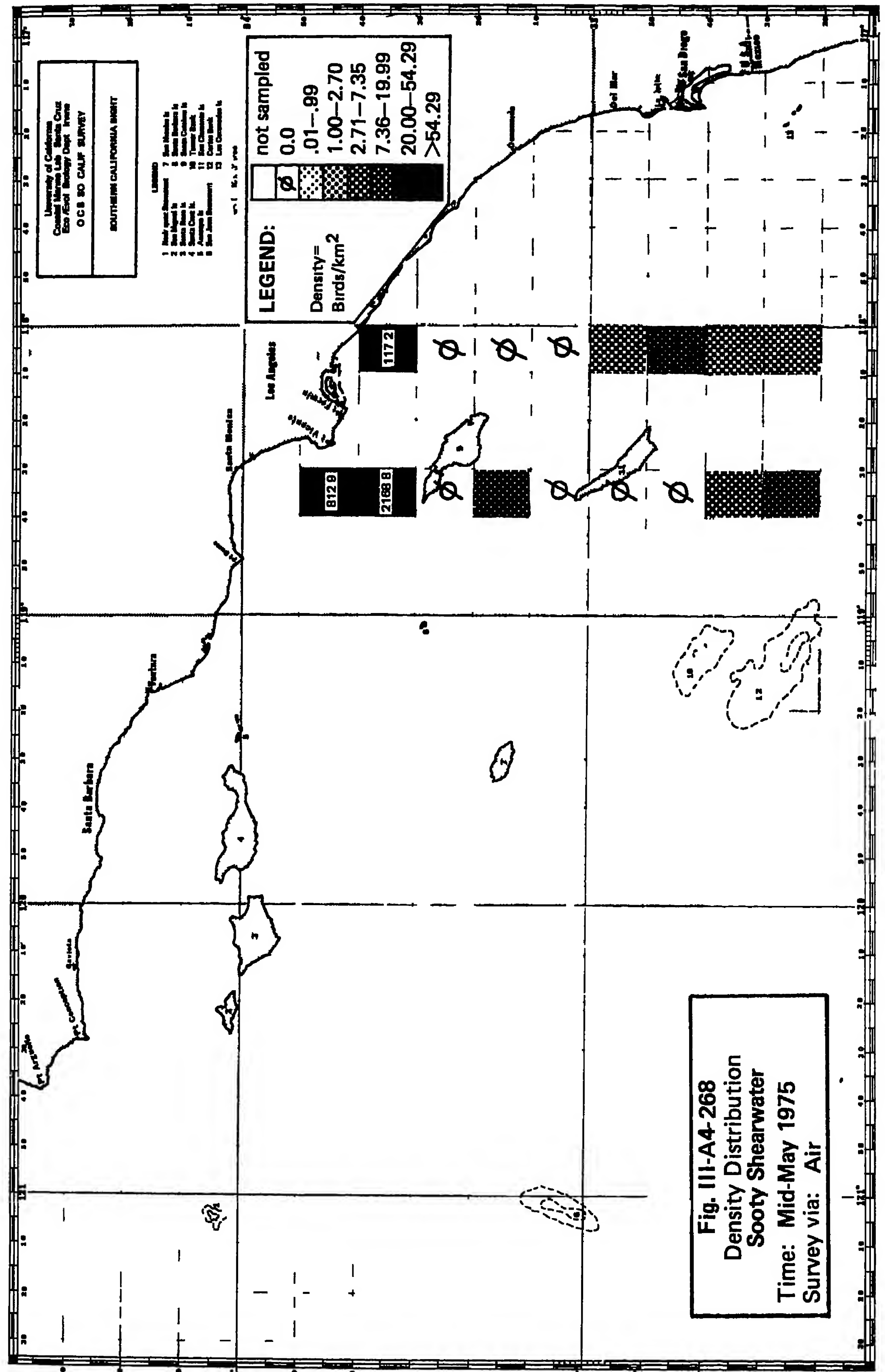


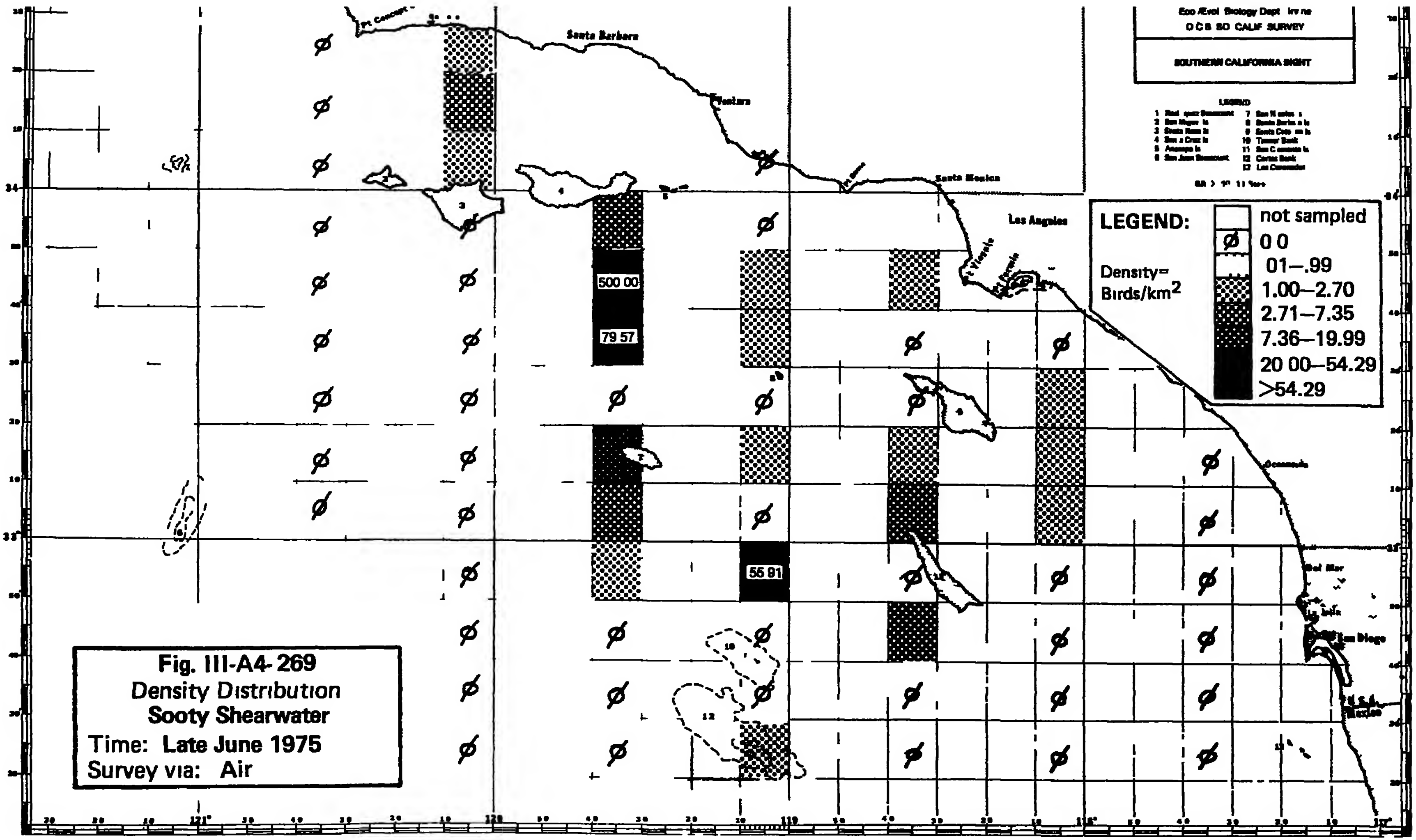
Fig. III-A4-268
Density Distribution
Sooty Shearwater
Time: Mid-May 1975
Survey via: Air

Santa Rosa Is., southeast of Pt. Mugu and along the northern Santa Rosa-Cortés Ridge. Aerial sampling showed high densities over Santa Cruz Basin and in the area 20 km north of Tanner Bank. Numbers tapered off markedly closer to shore (Fig. III-A4-269).

July 1975. The general distribution pattern was similar to that of the previous month, with the highest densities west of Santa Rosa Is. and around Wilson and Richardson Rocks, northwest of San Miguel Is. Another "hotspot" was located 19-27 km northwest of San Nicolas Is. along the Santa Rosa-Cortés Ridge, where a flock of 300 unidentified shearwaters, probably a mixture of Sooty and Pink-footed Shearwaters, was seen. Large flocks of 100+ birds were seen in Santa Cruz Basin, and the species was also commonly encountered 20 km northeast of Tanner Bank (Fig. III-A4-270). No aerial data are available for this month.

It is interesting that in 20.3% of the sightings where flight direction was noted, the shearwaters were flying northwest, and in 31.9% of the sightings they were flying west. The other 46.8% were flying in every direction except south. As shown in Fig. III-A4-271, birds seemed to be headed in a northwesterly direction, but there were no signs of mass movement (compare Fig. III-A4-275).

August 1975. Aerial surveys between 4 and 7 August yielded high densities of Sooty Shearwaters in Santa Barbara Channel, particularly north and west of San Miguel Is. (Fig. III-A4-272). The species was still common on the Santa Rosa-Cortés Ridge and in Santa Cruz Basin. A concentration of unidentified shearwaters (68.82 birds/km^2), probably Sooty and Pink-footed Shearwaters in an undetermined ratio, was recorded 18-27 km north of Tanner Bank. A ship survey later in the month again turned up high


Eco/Evol Biology Dept Irvine
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
Santa Barbara
Ventura
Santa Monica
Los Angeles
Oceanside
Del Mar
San Diego
LEGEND:
Density=
Birds/km2
not sampled
0 0
01—.99
1.00—2.70
2.71—7.35
7.36—19.99
20 00—54.29
>54.29
500 00
79 57
55 91
Fig. III-A4-269
Density Distribution
Sooty Shearwater
Time: Late June 1975
Survey via: Air

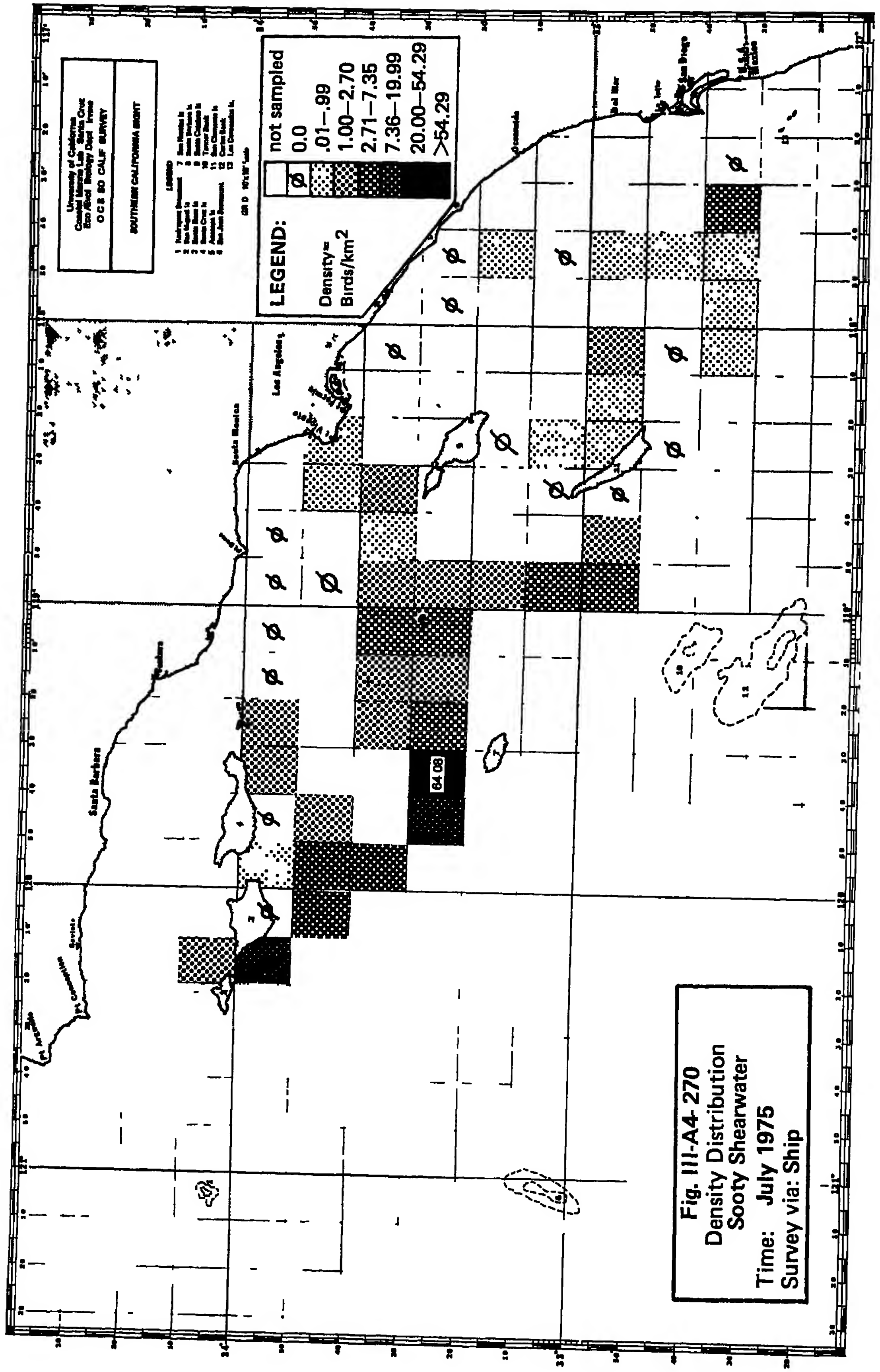


Fig. III-A4-270
Density Distribution
Sooty Shearwater
Time: July 1975
Survey via: Ship

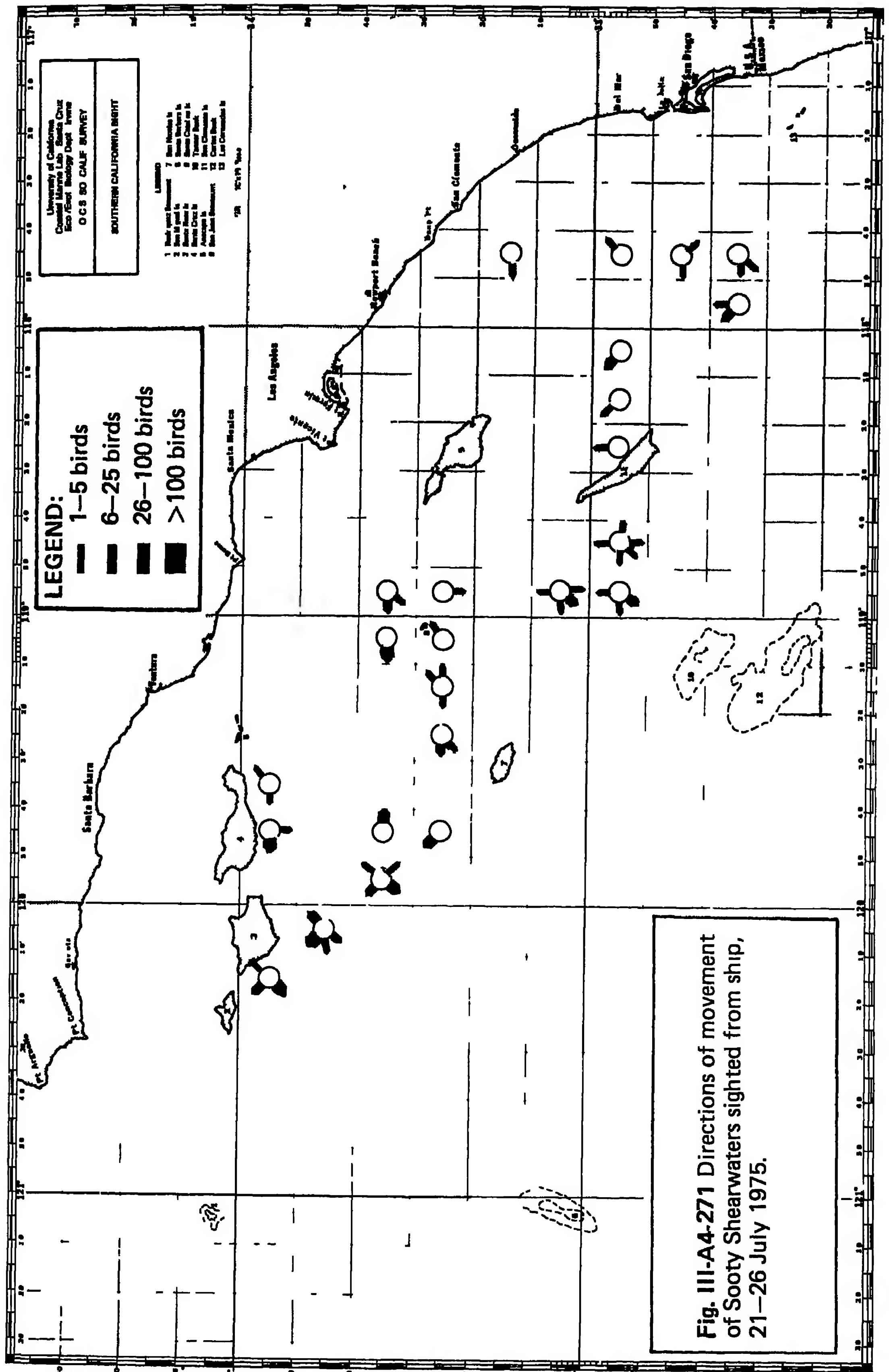


Fig. III-A4-271 Directions of movement of Sooty Shearwaters sighted from ship, 21–26 July 1975.

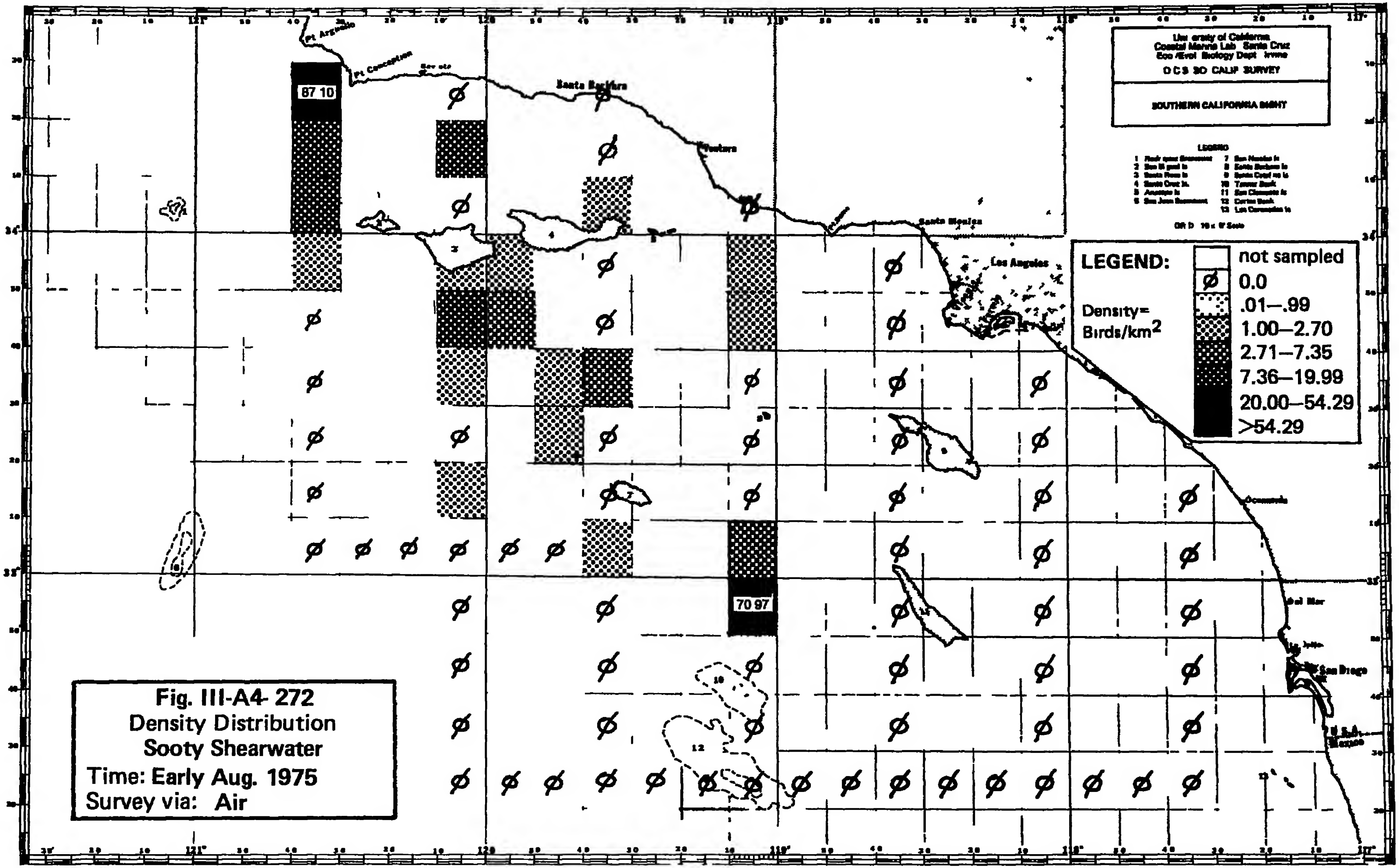


Fig. III-A4- 272
Density Distribution
Sooty Shearwater
Time: Early Aug. 1975
Survey via: Air

Sooty Shearwater (continued)

densities around Santa Rosa Is. (Fig. III-A4-273) and moderate numbers off Pt. Vicente. As usual, no birds were observed in the Gulf of Santa Catalina.

September 1975. The area near Santa Rosa and San Miguel Islands had the most shearwaters. A ship survey late in September (Fig. III-A4-274) showed that while densities were high around Santa Rosa and San Miguel Islands, they were relatively low elsewhere in the Bight. Analysis of flight direction revealed a general trend (northwest) toward San Miguel Is. and west from there (100% of those birds for which direction of movement was noted were moving west in the vicinity of San Miguel-Santa Rosa Islands [see Fig. III-A4-275]).

October 1975. No ship data are available for this month, but only two Sooty Shearwaters were sighted in a complete aerial survey (both 37 km northwest of San Miguel Is.).

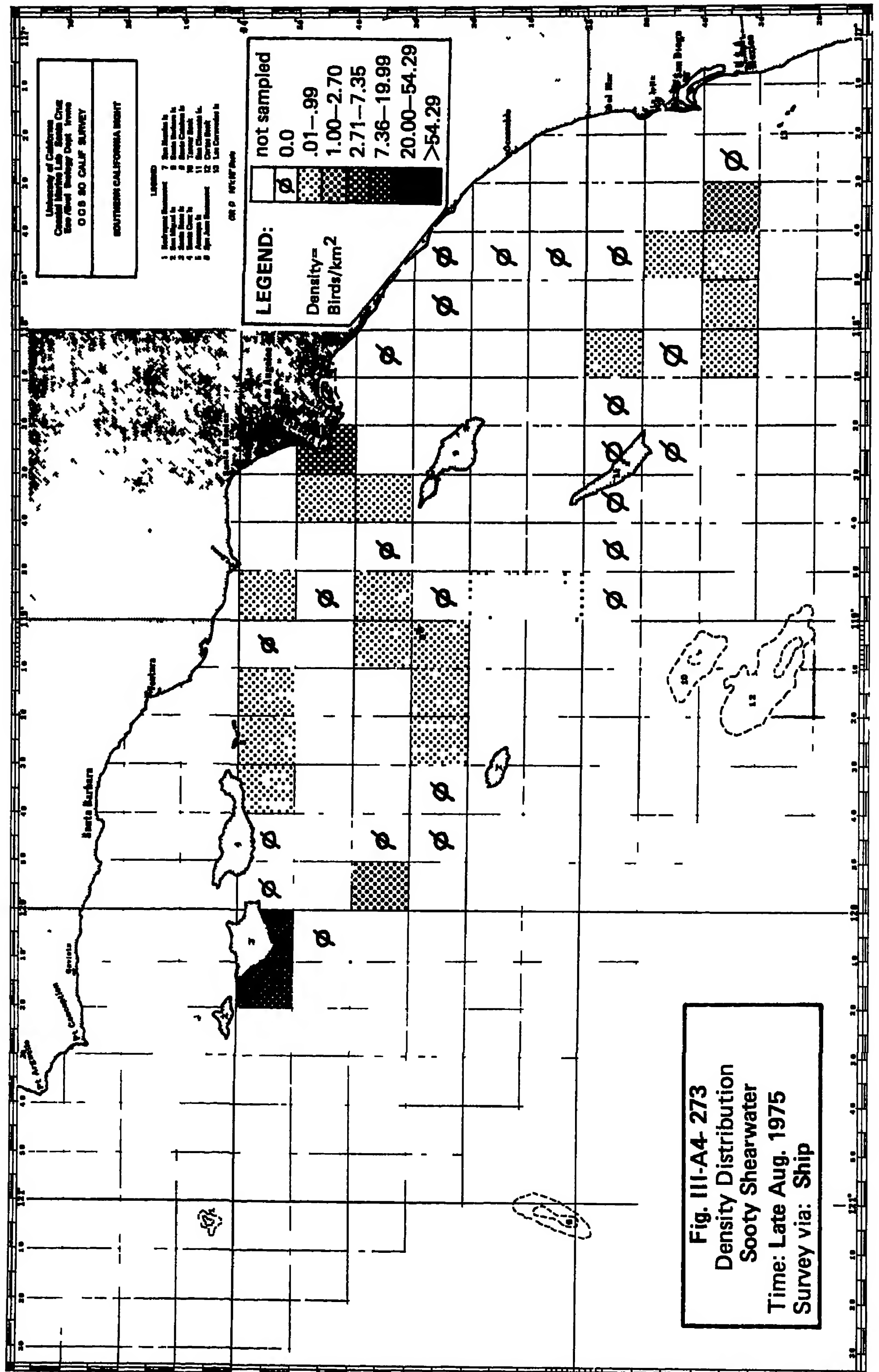
November 1975. The numbers were very low, with only 23 recorded; an unknown proportion of 21 unidentified shearwaters may also have been this species (Fig. III-A4-276).

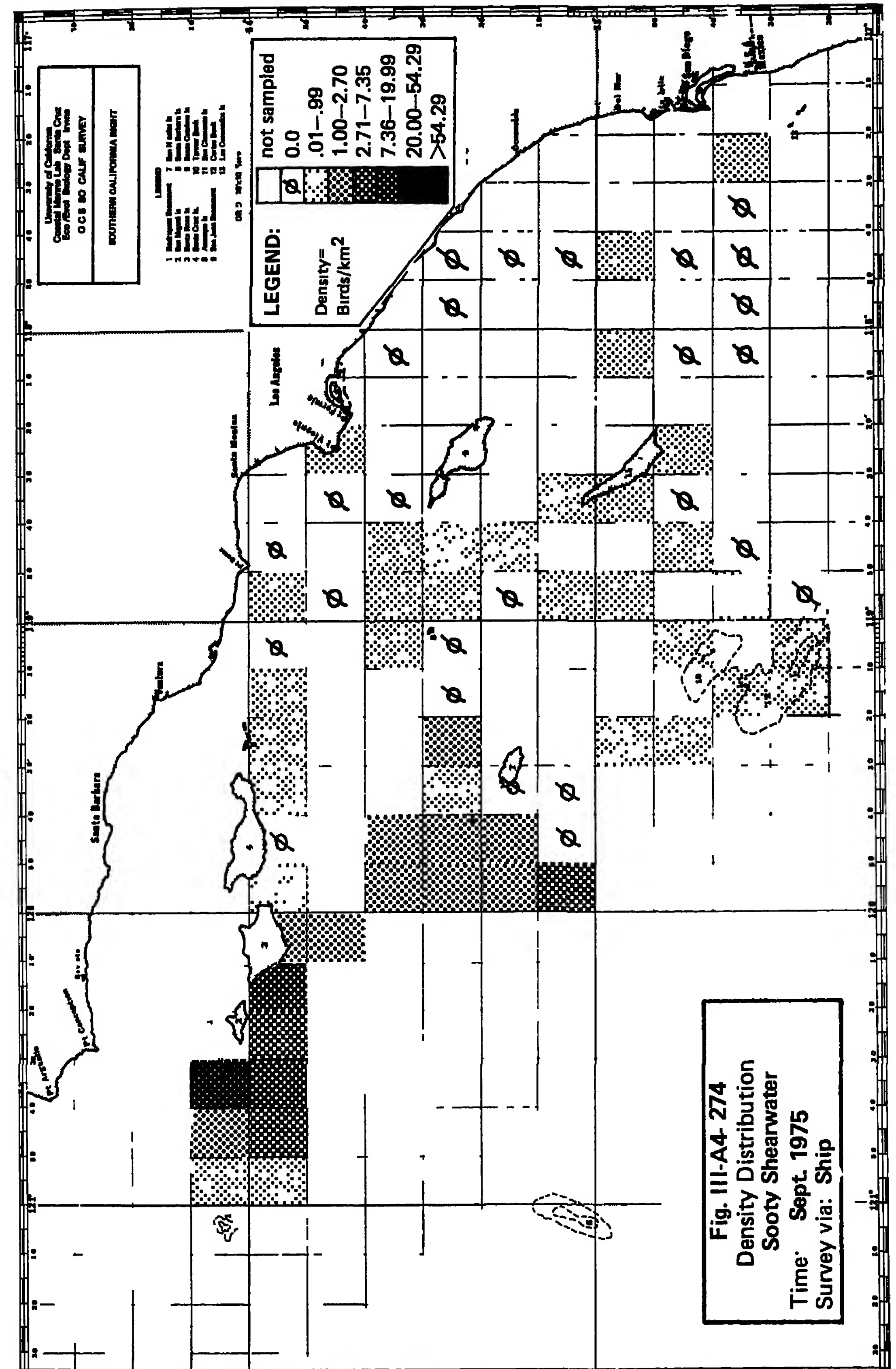
December 1975. None recorded.

January 1976. Only two birds of this species were recorded; one was seen approximately 35 km northwest of San Nicolas Is. during the standard ship survey from 5 through 10 January, and the other appeared about 18 km west of San Miguel Is., flying northwest in association with a flock of gulls.

February 1976. None recorded.

March 1976. A total of four birds was seen on 21-22 March. Two were


University of California
Coastal Marine Lab. Santa Cruz
Eco Evol. Biology Dept. Irvine
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Santa Barbara
Pt. Conception
Pt. Arguello
Fig. III-A4-273
Density Distribution
Sooty Shearwater
Time: Late Aug. 1975
Survey via: Ship


University of California
Coastal Marine Lab. Santa Cruz
Eco Evol. Biology Dept. Irvine
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Los Angeles
Santa Monica
Santa Barbara
Pt. Conception
Pt. Arguello
Fig. III-A4-274
Density Distribution
Sooty Shearwater
Time: Sept. 1975
Survey via: Ship

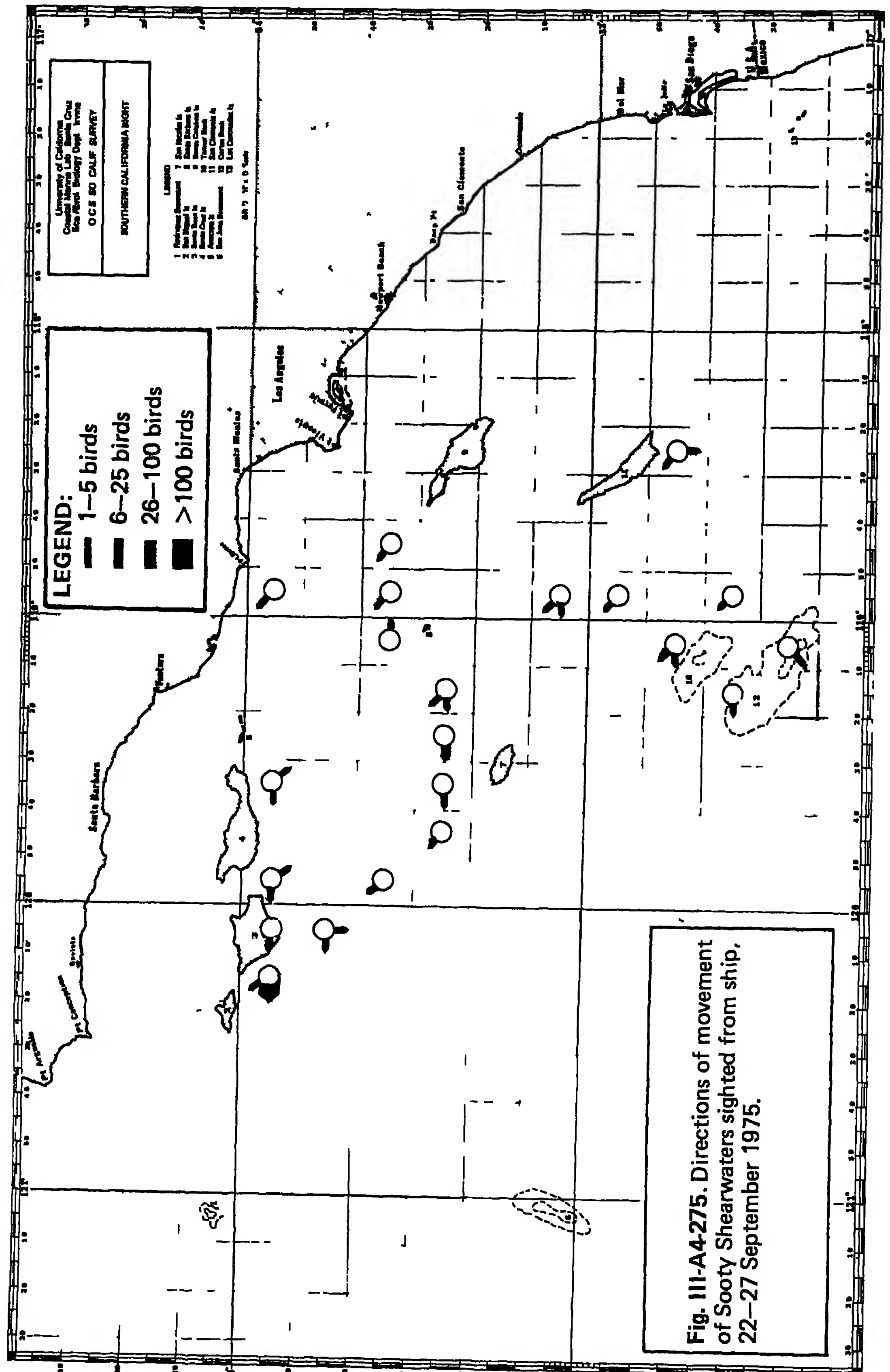


Fig. III-A4-275. Directions of movement of Sooty Shearwaters sighted from ship, 22–27 September 1975.

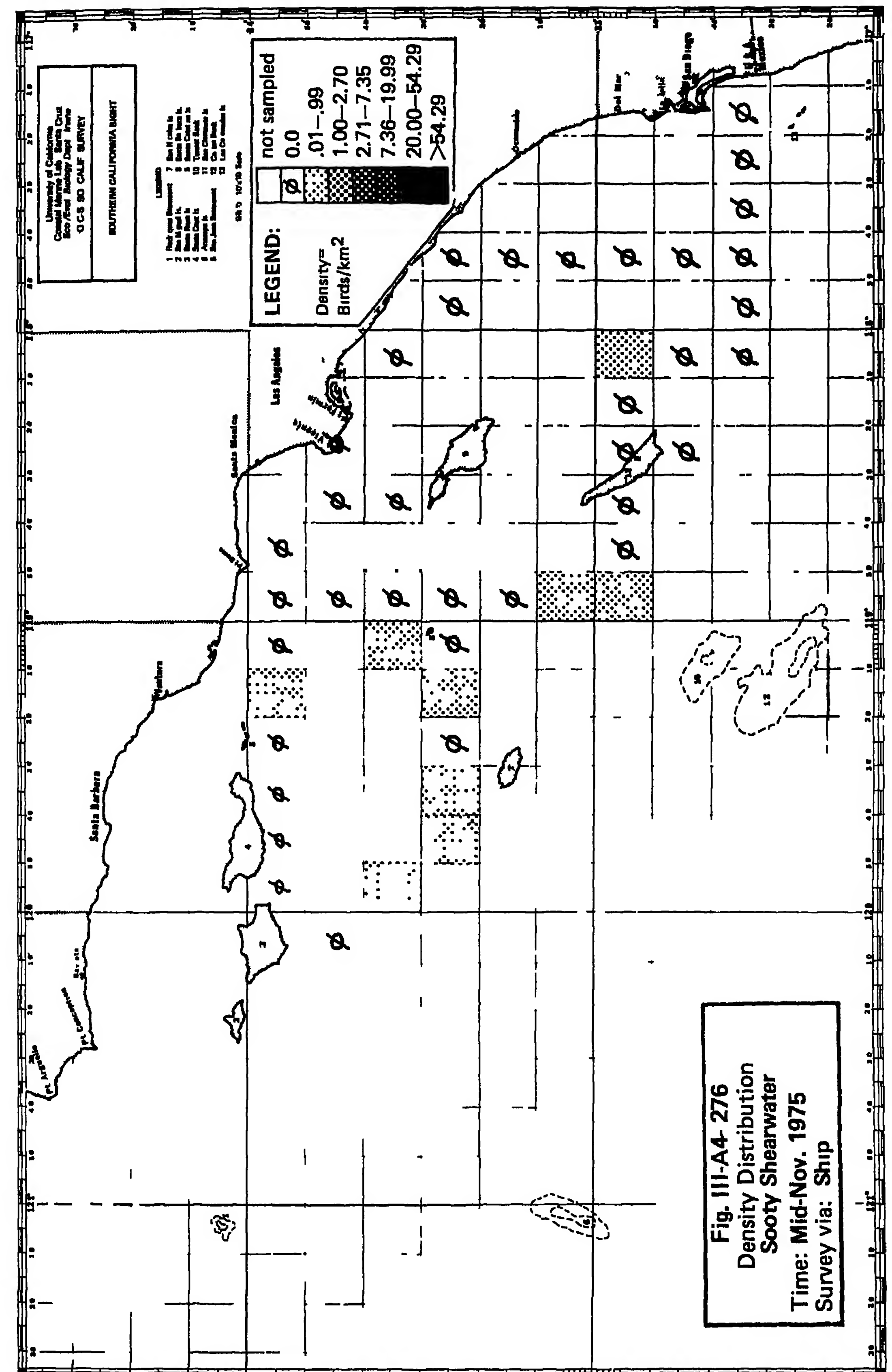


Fig. III-A4- 276
Density Distribution
Sooty Shearwater
Time: Mid-Nov. 1975
Survey via: Ship

Sooty Shearwater (continued)

seen in the vicinity of Anacapa Passage; one was on the water 11.5 km southeast of Anacapa Is.; and the fourth was encountered 18.5 km west of Santa Barbara Island.

Short-tailed Shearwater (*Puffinus tenuirostris*)

The Short-tailed Shearwater, also called the Slender-billed Shearwater, is closely related to the Sooty Shearwater which it resembles. From breeding grounds on islands in Bass Strait between Australia and Tasmania, it migrates each year in a transequatorial figure-eight around the Pacific Basin, passing northward near Japan in late April and early May and southward off the continental shelf of California in early winter before heading back across the South Pacific. Its migrations have been studied in detail by Serventy (1953, 1956) and Marshall and Serventy (1956).

In the Southern California Bight the species is a very rare and irregular late fall and winter visitor. Large numbers have never been reported (Grinnell and Miller 1944; Bender et al. 1974; Scott 1974; Small 1974). Presumably, the few birds entering the Bight are stragglers from the pre-breeding migration that passes southward farther to the west.

The food of this species consists of euphausiid crustaceans, small pelagic fish, cephalopods and other invertebrates (Palmer 1962).

1975-76 Baseline Data

Four records, see Vol. III, p. III-594.

Manx Shearwater (Puffinus puffinus)

The Pacific form of the Manx Shearwater (sometimes called the Black-vented Shearwater, P.p. opisthomelas) breeds in large colonies on islands off the Mexican coast of Baja California in early spring. It migrates northward in late summer, and on rare occasions may reach Vancouver Is. It is an irregular visitor at all seasons to the Southern California Bight, being most frequently seen in the fall and winter months, especially November through January (Howell 1917, McCaskie 1968-1974, Scott 1974, Small 1974). It frequents waters closer inshore than other shearwaters (Palmer 1962, Scott 1974). Birds of this species are often found in large numbers near San Diego, but sightings are more irregular farther north. The number of birds sighted annually is variable, although there are undoubtedly some birds present every year. McCaskie (1969b) reports only 10 birds off San Diego on 24 November 1969 and 700 in the same area one year later (McCaskie 1970b). He also reports 5,000 Manx Shearwaters feeding on squid off San Diego in December 1967, although he makes no mention of how this was determined. Birds often collect around shoals of fish, the presence of which largely determines their numbers and distribution.

Little is known of the foods exploited by this species, but fish such as herring and sardines appear to be the mainstay of its diet; squid has also been reported as a prey item (Palmer 1962, McCaskie 1968b).

1975-76 Baseline Data

April - October 1975. None recorded.

November 1975. Four birds were encountered by shipboard observers between 16 and 21 November. A single bird was seen flying north 30 km southwest

Manx Shearwater (continued)

of San Diego, just north of the Mexican border, and three more birds were recorded 15 km southwest of Pt. Loma in association with Bonaparte's Gulls.

December 1975. One bird was seen from the ship 26 km south of Pt. Mugu on 16 December.

January - March 1976. None recorded.

Fork-tailed Storm-Petrel (Oceanodroma furcata)

The breeding range of the Fork-tailed Storm-Petrel rings the North Pacific from the Kurile Islands north of Japan to the offshore islands of north-central California. They are burrow-nesters, colonial, and nocturnal ashore. The limits of their post-breeding dispersal are as yet uncertain, but the species appears to be widespread and highly pelagic, although strong winds or storms may force individuals closer to shore (Small 1974). Crossin (1974) reports the species to be common in the central and eastern Pacific north of 40°N, the pelagic range paralleling the circuit of nesting areas. Birds travel singly, in small groups or in large flocks of 300-500 individuals.

In southern California the Fork-tailed Storm-Petrel is a rare and sporadic visitor from northern counties. Its seasonal status varies; records exist for every season, but the species seems to be most frequently encountered in fall or winter (Grinnell and Miller 1944, Pyle and DeLong 1968 ms, Scott 1974, Small 1974).

Palmer (1962) describes the species as feeding on fish, crustaceans, fish offal and floating oils from wounded seals or whales which is skimmed from the water's surface. Birds frequently congregate about a plentiful food source.

1975-76 Baseline Data

Four records, see Vol. III, p. III-594.

Leach's Storm-Petrel (_Oceanodroma leucorhoa_)

Birds encountered in southern California waters are most likely from the populations nesting from southeastern Alaska to Los Coronados Islands. Since it is impossible to distinguish the "sub-species", even in the hand, except possibly for exceptionally large or small individuals, the exact origin of the birds found in these waters is uncertain (Crossin 1974).

The migration patterns and pelagic distribution of the Pacific populations are little known. Leach's Storm-Petrels are generally considered cool-water birds in the breeding season and are widespread in tropical areas during the winter (Palmer 1962, Crossin 1974, Scott 1974). Migrants are present from April through October (Grinnell and Miller 1944, Pyle and DeLong 1968 ms, Crossin 1974, Scott 1974, Small 1974). However, the true vagility of the populations on the coastal Mexican islands, including the Guadalupe Islands, is not actually known. Crossin (1974) considers them sedentary, but Pyle and DeLong (1968 ms) note that Leach's Storm-Petrel was the only common storm-petrel in their offshore Eastern Grid, with peak numbers found west of San Miguel Is. The birds of the last locality are most likely only transient there. Birds are usually seen as singles, but flocks to 375 individuals have been recorded (Scott 1974).

Several sub-species are ascribed to Leach's Storm-Petrel in the Pacific Ocean basin, according to breeding location and morphological variation. Rump color is exclusively white in birds breeding north of the Farallon Islands, San Francisco Co., California, to the Alaskan islands (Ainley in lit.) and in the sub-arctic regions of the Atlantic Ocean. The southern breeding population on the San Benitos Islands,

Leach's Storm Petrel (continued)

Baja California, Mexico, is made up entirely of dark-rumped birds. All other populations (Guadalupe Islands, islands north of the San Benitos through and including the Farallons) are composed of individuals possessing rumps ranging from dark to white (see discussion in Crossin 1974, Ainley in lit.).

The food of this species consists of fish, molluscs, crustaceans, oily substances and garbage from vessels (Palmer 1962). Scott (1974) also reports Hydrozoans, primarily Velella sp., as the single most important food item off Oregon, followed by euphausiids, other crustaceans and small fish.

1975-76 Baseline Data

April - May 1975. None recorded.

June 1975. There were only eight definitive sightings of Leach's Storm-Petrels this month (all aerial, all white-rumped): along the western edge of the Santa Rosa-Cortés Ridge, in San Nicolas Basin, over Tanner and Cortés Banks, and in the Fortymile Bank-Coronado Escarpment region. Moderate numbers of unidentified petrels, probably of this species, were also recorded in the same general areas (Fig. III-A4-277).

July 1975. The numbers of storm-petrels seen in the Bight increased markedly during this month. The highest densities of Leach's were observed directly over Fortymile Bank at the end of the month (Fig. III-A4-278). Birds of this species were also encountered by shipboard observers along the Santa Rosa-Cortés Ridge and 20-40 km west of San Clemente Is.

August 1975. Leach's Storm-Petrels were common this month with the greatest concentrations again located between Fortymile Bank and the

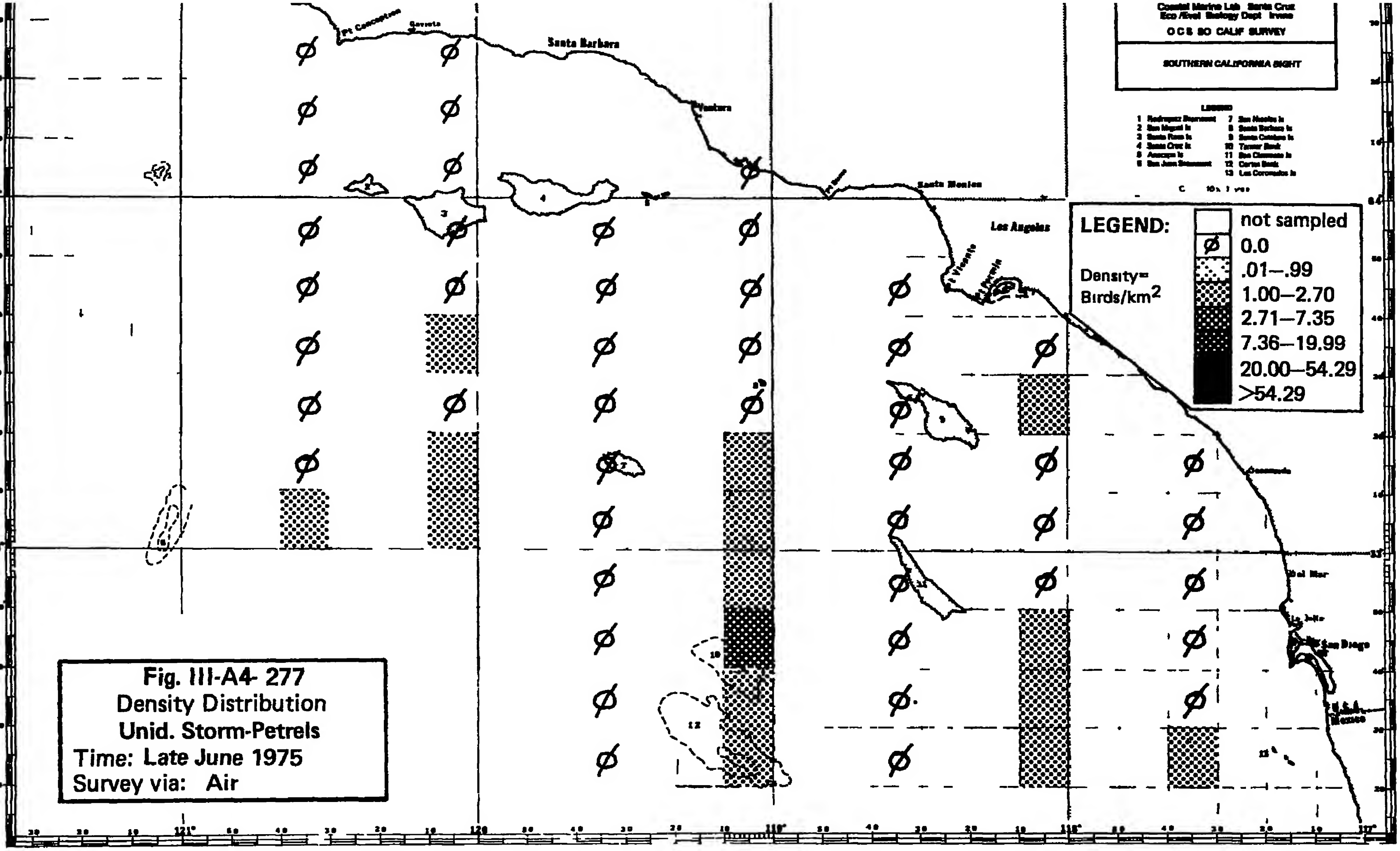


Fig. III-A4- 277
Density Distribution
Unid. Storm-Petrels
Time: Late June 1975
Survey via: Air

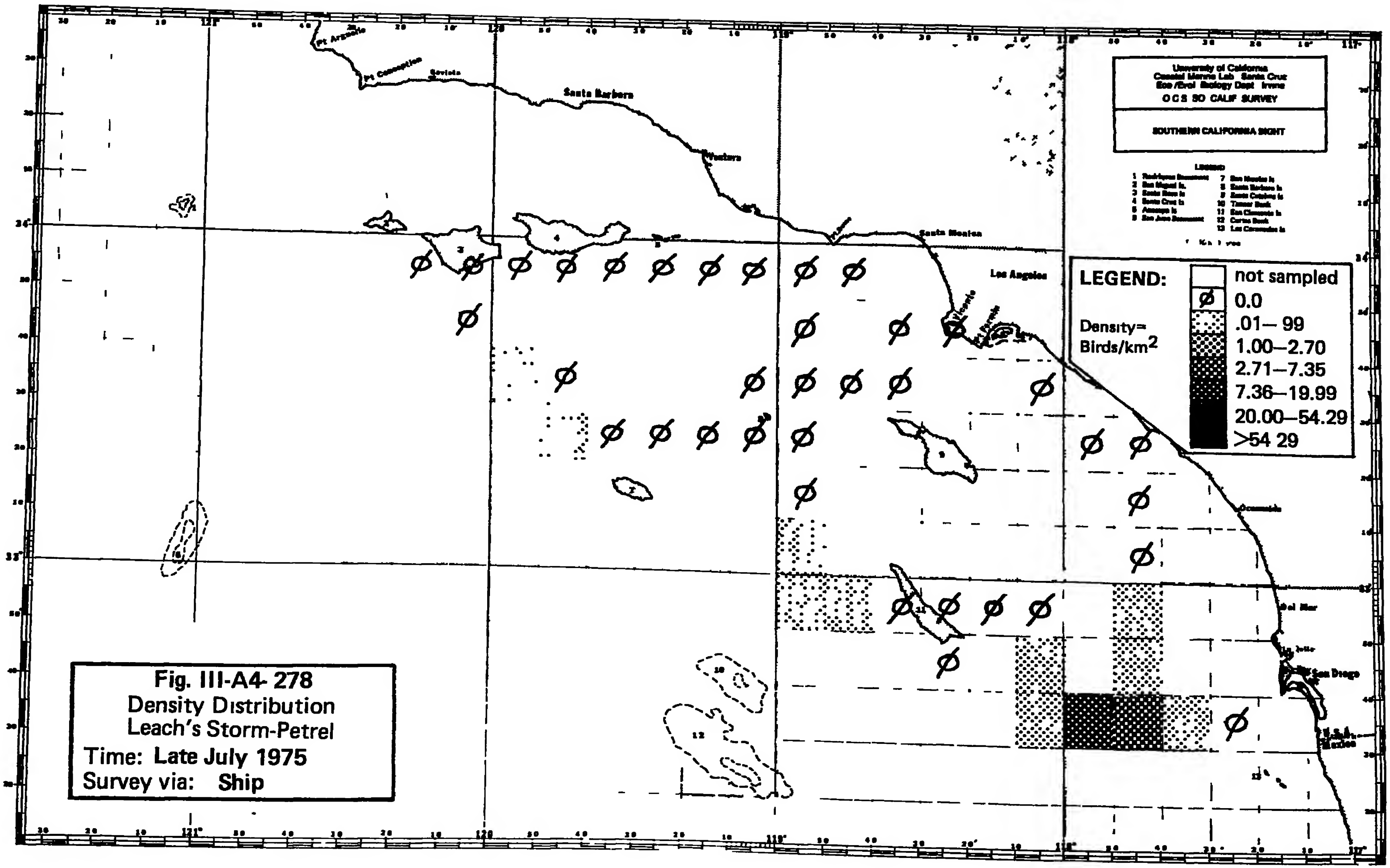


Fig. III-A4- 278
Density Distribution
Leach's Storm-Petrel
Time: Late July 1975
Survey via: Ship

Coronado Escarpment (Figs. III-A4-279, 280). They were also common far offshore over the Patton Escarpment, north of San Nicolas and Santa Catalina Islands and west of San Clemente Is.

September 1975. The major concentrations of birds of this species were situated in the Tanner-Cortés area. Leach's Storm-Petrels were also encountered offshore between San Miguel Is. and Rodriguez Seamount, in Santa Cruz Basin and, as usual, over Fortymile Bank (Fig. III-A4-281).

October 1975. The Tanner-Cortés and Fortymile Bank areas again proved to have the highest activity during the aerial survey between 23 and 26 October, although the numbers were relatively low (four sightings of only one or two birds at a time).

November 1975 - March 1976. None recorded. A few unidentified storm-petrels were, however, seen on the western edge of the Santa Rosa-Cortés Ridge.

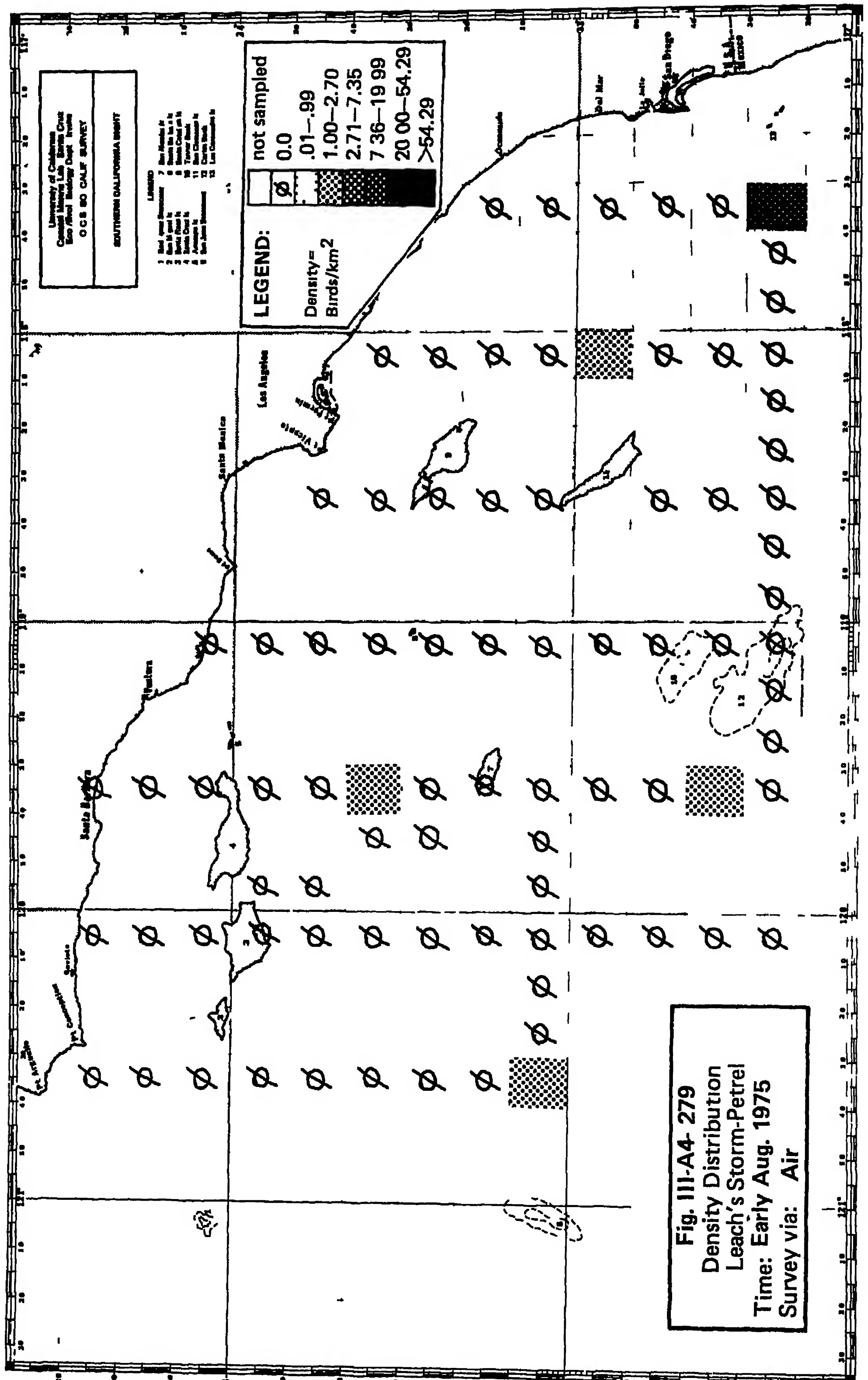


Fig. III-A4- 279
Density Distribution
Leach's Storm-Petrel
Time: Early Aug. 1975
Survey via: Air

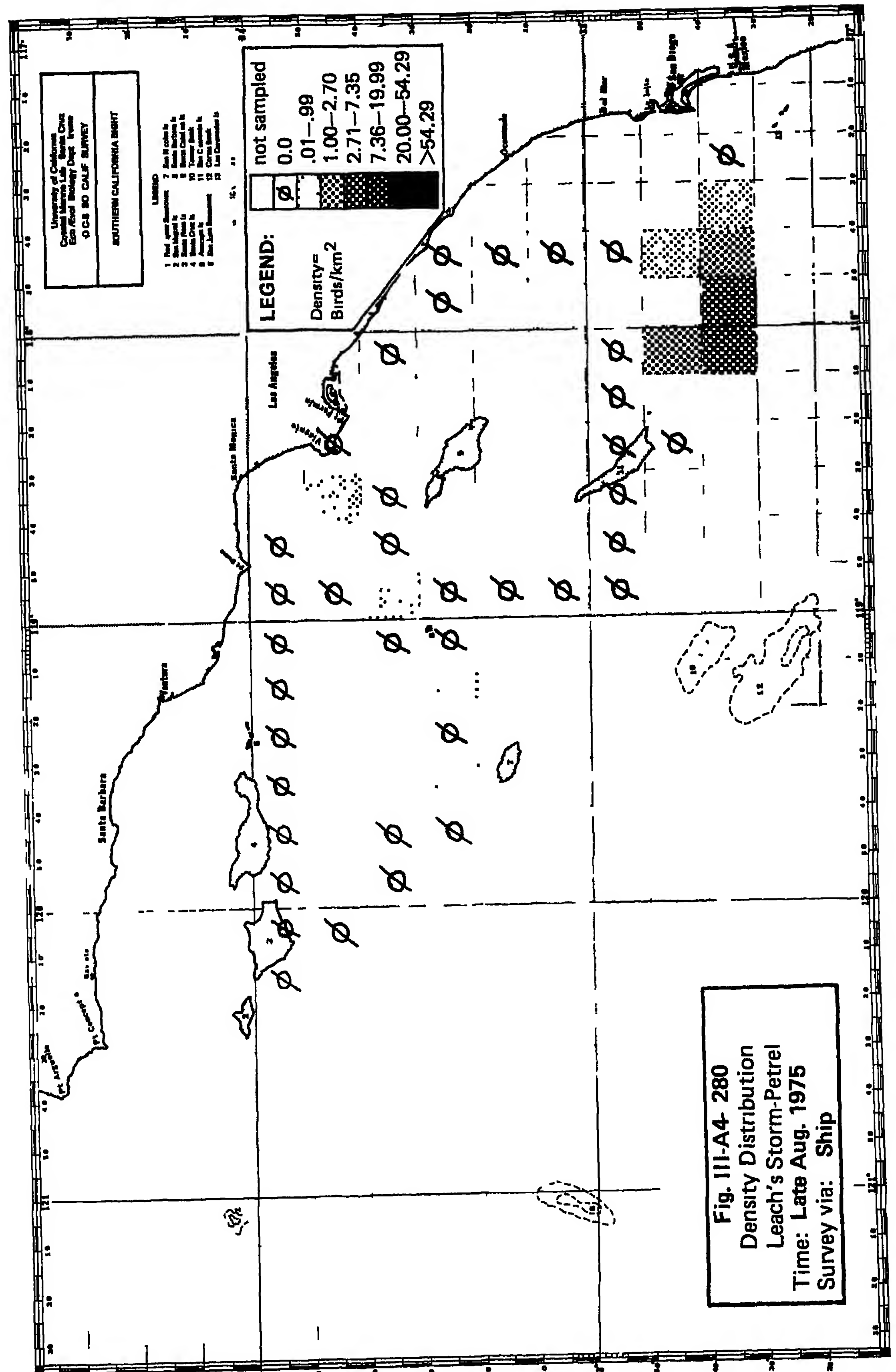


Fig. III-A4- 280
Density Distribution
Leach's Storm-Petrel
Time: Late Aug. 1975
Survey via: Ship

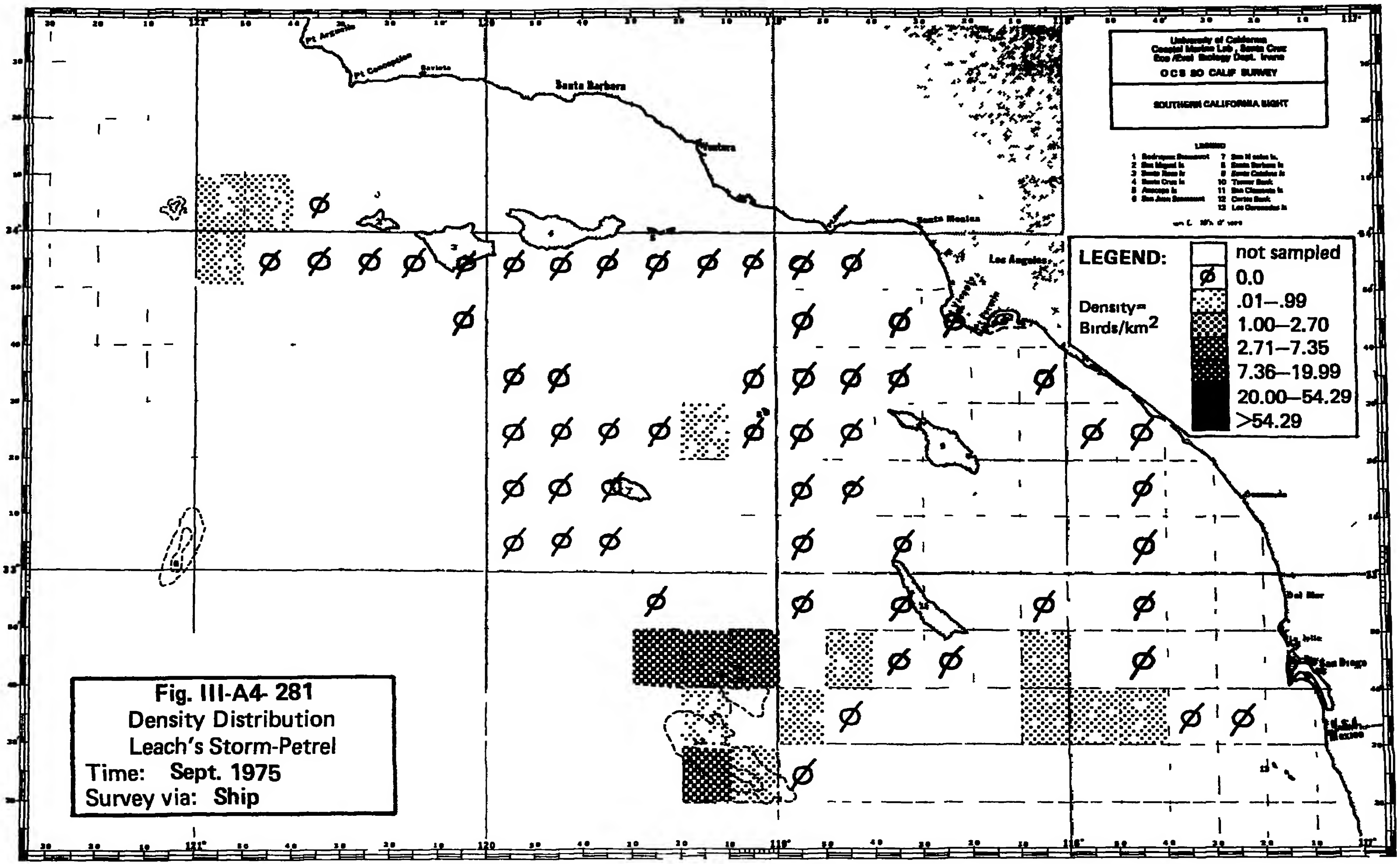


Fig. III-A4- 281
Density Distribution
Leach's Storm-Petrel
Time: Sept. 1975
Survey via: Ship

Ashy Storm-Petrel (Oceanodroma homochroa)

Ashy Storm-Petrels breed on offshore California islands from the Farallon Islands, San Francisco Co., south to Los Coronados Islands, Baja California Norte, Mexico (Palmer 1962). The largest known population is on the Farallon Islands, and most of our knowledge of the species breeding biology comes from there (see Palmer 1962; Ainley et al. 1975). Smaller colonies exist on San Miguel and Santa Cruz Islands and their immediate offshore rocks and islets. The birds nest in burrows and natural cavities and are nocturnal on the colony.

This species is apparently restricted to the "vicinity" of its home islands and is correspondingly most abundant from the Farallon Islands south to west-central Baja California (Crossin 1974). However, it is absent from its breeding grounds from December through April. In Southern California it is locally and irregularly common. There are no definite records of this bird in the P.O.B.S.P. offshore Eastern Grid sector (Pyle and DeLong 1968 ms) but there are scattered sightings along this coast. The paucity of records may stem to a large degree from the dificulty of distinguishing it in the field from other small, dark-rumped storm-petrels.

Little information is available on the foods of this species. It is presumed to feed on fish, small molluscs and algae (Palmer 1962).

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breedinq status data collected during the 1975-76 season are summarized on pp. III-531-532.

Ashy Storm-Petrel (continued)

1975-76 Baseline Data

April 1975. Two Ashy Storm-Petrels were recorded over Osborn Bank in the channel between San Nicolas and Santa Barbara Islands.

May 1975. Two birds were seen this month over Santa Cruz Basin (Fig. III-216).

June 1975. None recorded.

July 1975. The greatest numbers of Ashy Storm-Petrels seen in the study area were recorded from Santa Cruz Basin north to Santa Cruz Channel this month. Birds were sighted singly or in flocks of 3 to 60; the largest groups occurred in Santa Cruz Basin at mid-month (Fig. III-216).

August 1975. A single bird was seen on 26 August, 9.25 km south of Pt. Dume. In addition, aerial sightings of five unidentified storm-petrels were reported immediately south of Santa Cruz Is. on 7 August.

September 1975. Ashy Storm-Petrels were encountered regularly in low numbers (two to four birds per sighting) 24 km west of San Miguel Is. and over the northern Santa Rosa-Cortes Ridge east to Santa Cruz Basin (Fig. III-216).

October 1975. None recorded.

November 1975. One bird was seen near Osborn Bank on the 18th.

December 1975. Shipboard observers encounted a mixed flock of 150 Black and Ashy Storm-Petrels in approximately equal proportions on the water directly over Tanner bank on 18 December. Some of the 20 unidentified petrels seen in the area may also have been Ashy.

January 1976 Only one possible record exists for this month; one bird was seen 44.5 km west of La Jolla on 10 January.

February - March 1976. None recorded.

Black Storm-Petrel (Oceanodroma melania)

The Black Storm-Petrel breeds on offshore islands from Los Coronados Islands south to Islas San Benitos, Baja California Norte, and on islands in the Gulf of California, Mexico. It nests in naturally-occurring crannies and recesses, but seems to prefer burrows excavated by Cassin's Auklets (Ptychoramphus aleuticus) or other petrels (Bent 1922, Palmer 1962). This storm-petrel is also exclusively nocturnal on the colony.

The species' post-breeding migration takes it south to the equator in winter and north to 38°N in late summer and fall. It is common locally in southern California from May to October, and there are a few winter records north of 33°N (Grinnell and Miller 1944, Crossin 1974, Scott 1974, Small 1974). The species shows a preference for warmer, coastal waters and tends to remain closer to shore than Leach's Storm-Petrels. These birds are most often seen singly, but flocks of up to 2,000 birds do occur (McCaskie 1971a).

Much like other storm-petrels, Black Storm-Petrels feed on fish, squid and garbage (Palmer 1962).

1975-76 Baseline Data

April 1975. None recorded.

May 1975. Aerial and ship surveys revealed low numbers of Black Storm-Petrels east of longitude 119°W, generally less than 40 km from shore (Fig. III-A4-282). The birds were fairly evenly distributed from Pt. Dume southeast to San Clemente Basin (from aerial survey, not illustrated).

June 1975. None recorded.

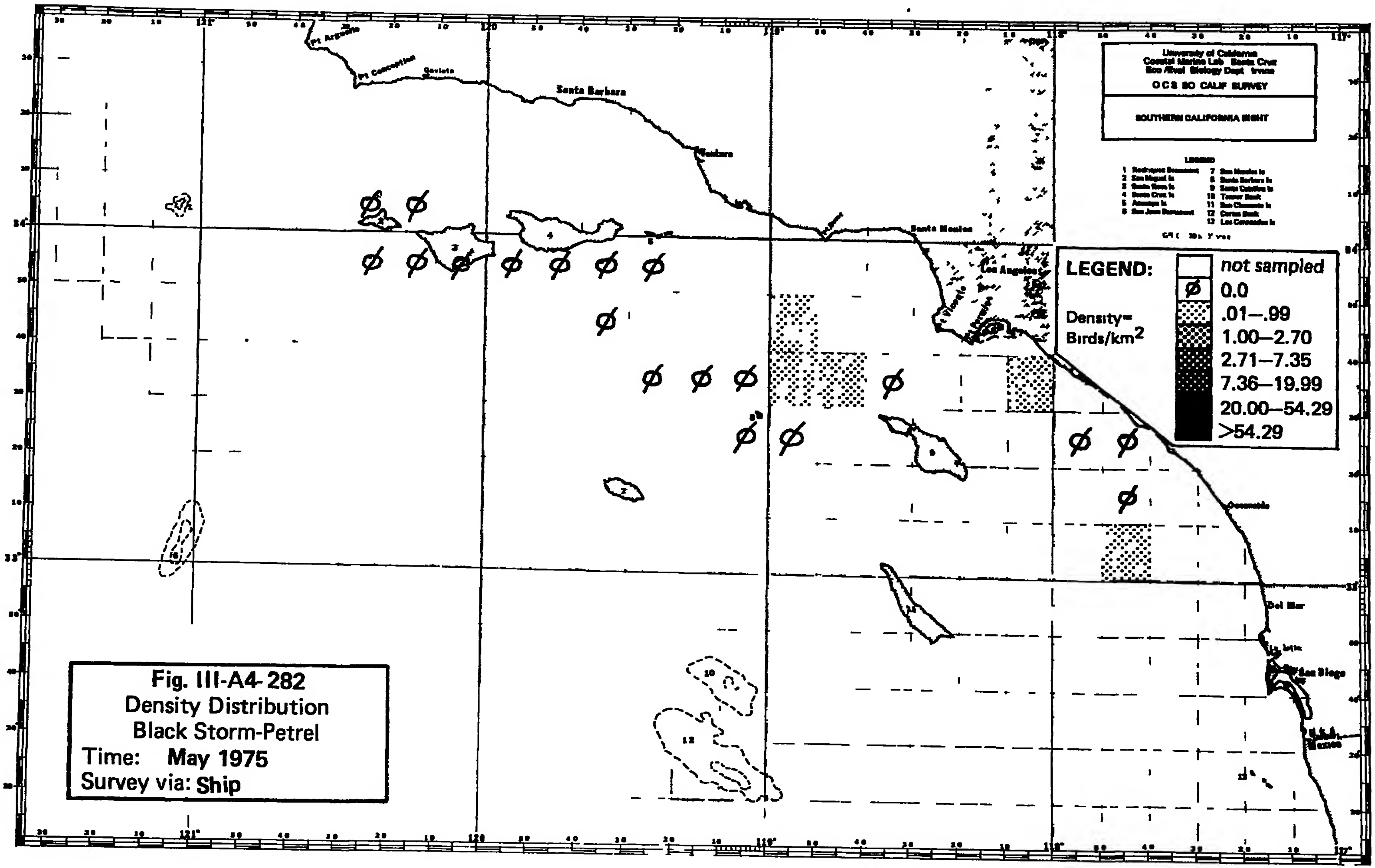


Fig. III-A4-282
Density Distribution
Black Storm-Petrel
Time: May 1975
Survey via: Ship

Black Storm-Petrel (continued)

July 1975. Low numbers were again recorded, most consistently in the area southeast of San Clemente Is., east to the Coronado Escarpment (Fig. III-A4-283). One bird of this species was also sighted just south of Santa Rosa Is.

August 1975. These storm-petrels were distributed fairly evenly, close to the shoreline from south of Santa Cruz Is. to the Mexican border (Fig. III-A4-284). The area immediately south & east of Santa Cruz Is. and between San Clemente Is. and the mainland were the most active. Scattered sightings of unidentified storm-petrels, which may have been Black Storm-Petrels, were recorded over the Santa Rosa-Cortés Ridge and in the Gulf of Santa Catalina.

September 1975. Black Storm-Petrel numbers rose during the month of September, as determined by ship surveys during the second and fourth weeks of the month. While common throughout the Bight, the species was most abundant in the area from San Clemente Is. southeast to the mainland (Fig. III-A4-285). Sightings were also made west of San Miguel Is. (20 km east of Rodriguez Seamount) north of San Nicolas Is., and in the vicinity of Tanner and Cortés Banks.

October 1975. Very few Black Storm-Petrels were recorded this month, mostly over the Coronado Escarpment. Several unidentified storm-petrels, possibly this species, were seen from the air in association with an unidentified baleen whale 43 km south of Santa Rosa Is.

November 1975. None recorded.

December 1975. A mixed flock of 150 Black and Ashy Storm-Petrels in approximately equal proportions was spotted on the water by shipboard observers directly over Tanner Bank on 18 December. Black Storm-Petrels

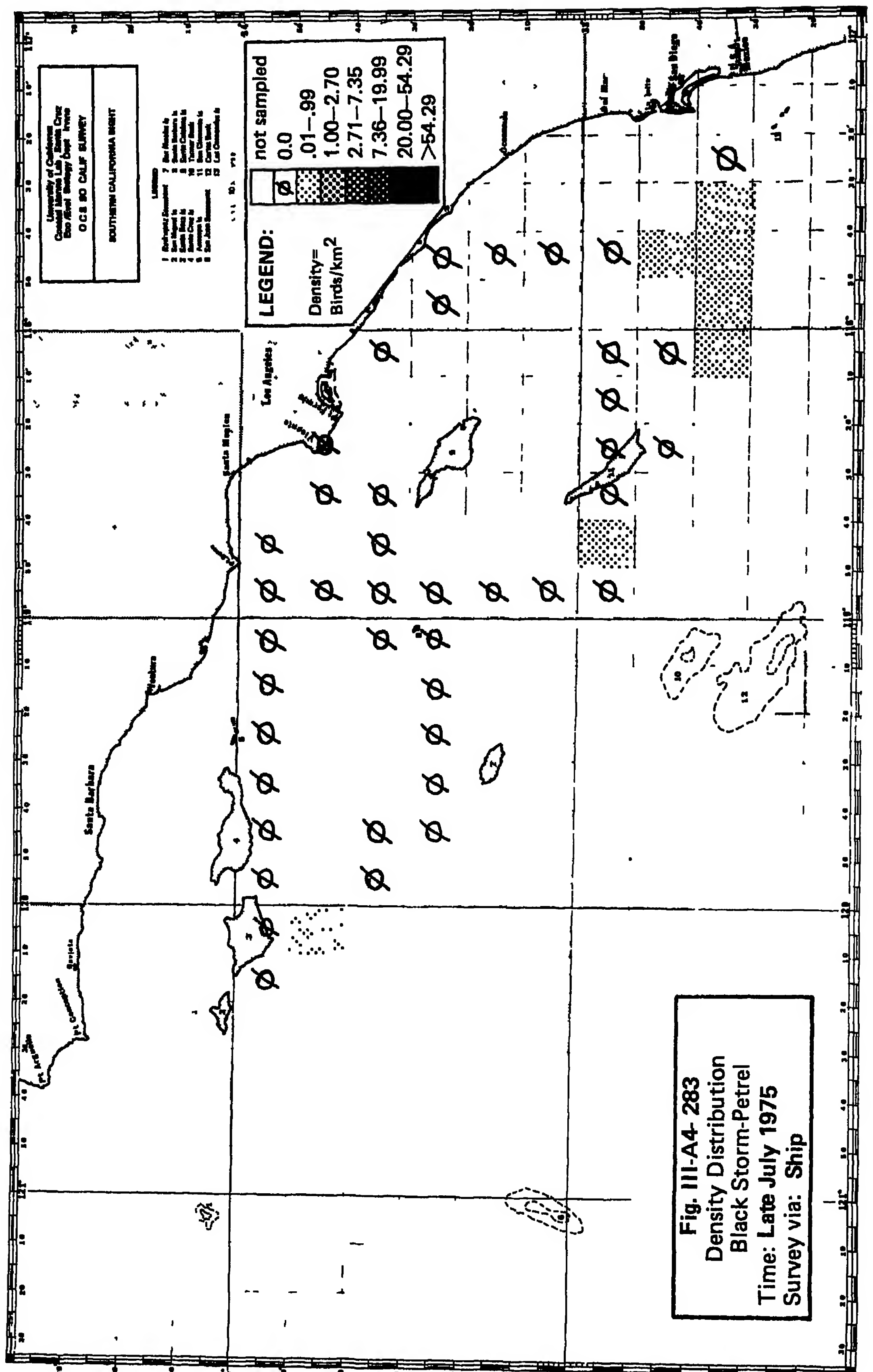


Fig. III-A4- 283
Density Distribution
Black Storm-Petrel
Time: Late July 1975
Survey via: Ship

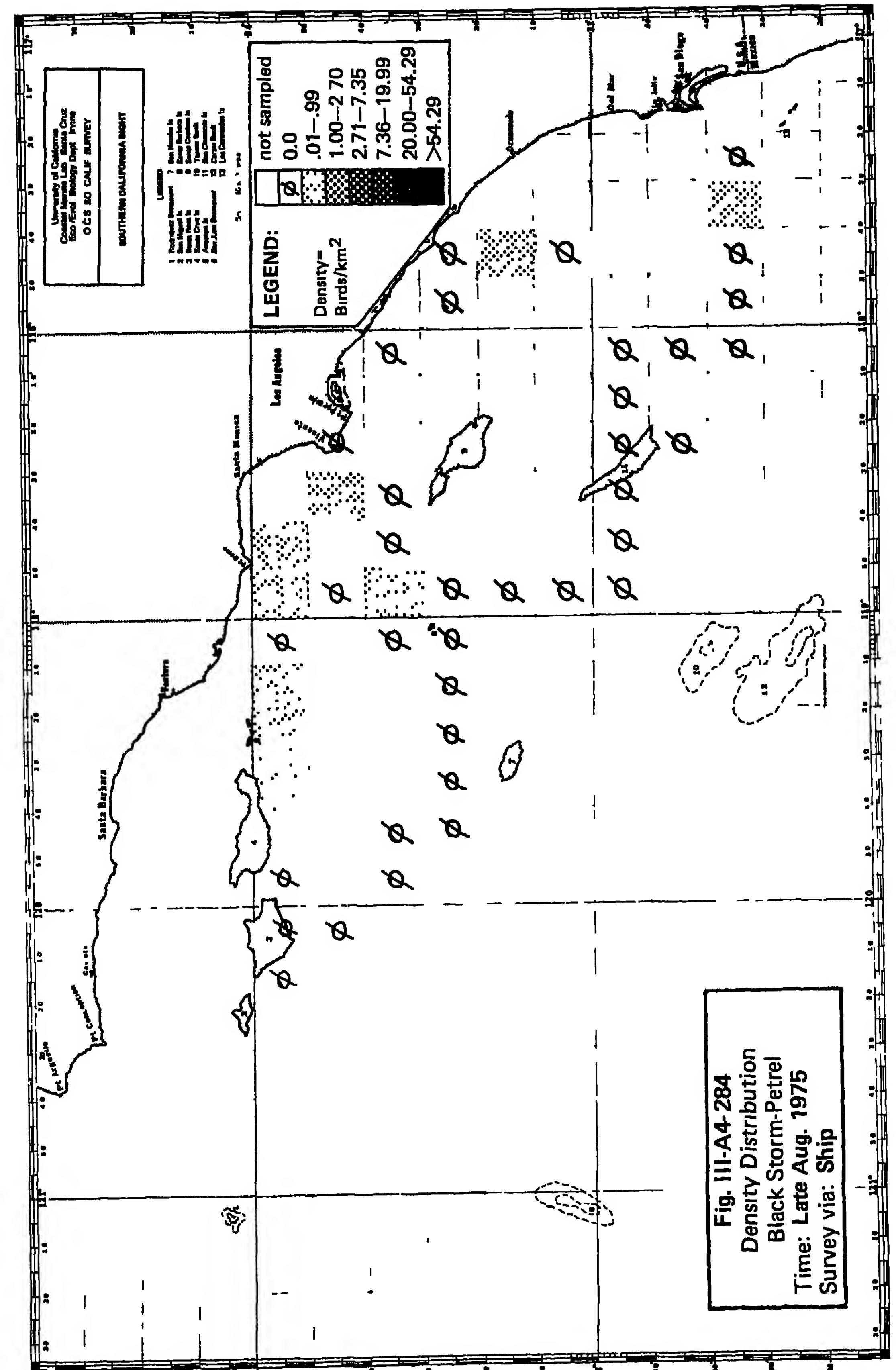


Fig. III-A4-284
Density Distribution
Black Storm-Petrel
Time: Late Aug. 1975
Survey via: Ship

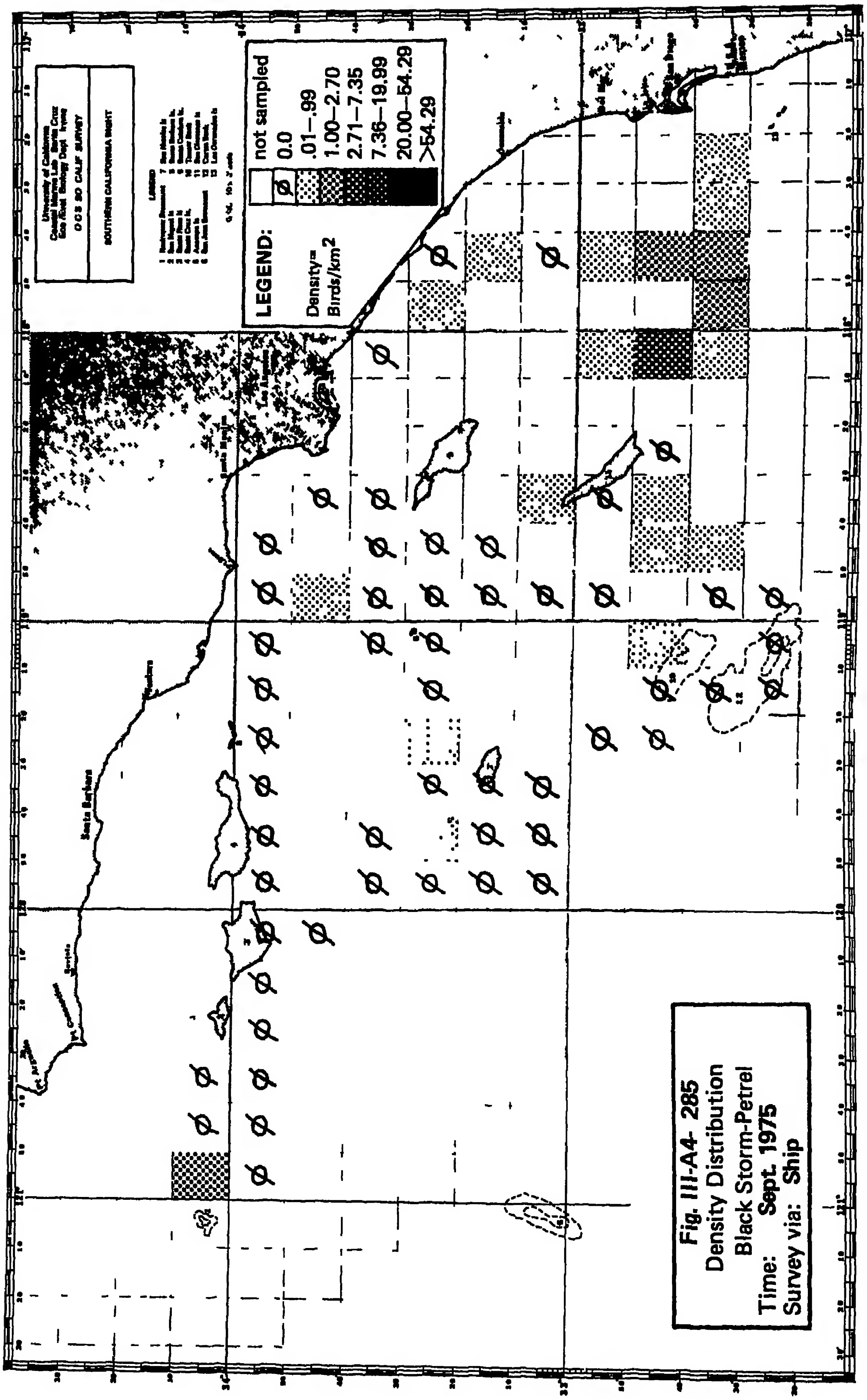


Fig. III-A4- 285
Density Distribution
Black Storm-Petrel
Time: Sept. 1975
Survey via: Ship

Black Storm-Petrel (continued)

were also encountered over Fortymile Bank. A flock of 20 unidentified storm-petrels, probably this species, was also recorded in this area on 19 December.

January 1976. The only definitive sighting was one bird directly over Fortymile Bank during the second week of the month.

February - March 1976. None recorded.

Least Storm-Petrel (Halocyptena microsoma)

The Least Storm-Petrel is distinguishable in the field from other dark-rumped storm-petrels by its minute size and short, wedge-shaped tail. Its breeding grounds include the San Benitos Islands, Baja California Norte, Mexico, and islets and outlying rocks of the Gulf of California, where it nests in rock crevices. It migrates south to wintering grounds in the Gulf of Panama, where it is abundant from December to April (Crossin 1974). The northward flight occurs from April to June along the coast of the Mexican mainland and Baja California. Its habitat seems to be the warmer side of tropical convergences, some birds migrating back and forth across the equator with the seasons (Palmer 1962).

This petrel is an irregular visitor to southern California during summer and fall, occurring almost exclusively in extreme southern waters between San Clemente Is. and San Diego (Grinnell and Miller 1944, McCaskie 1964-1972, Scott 1974). More northern occurrences include five between Dana Pt. and Santa Catalina Is. on 17 Spetember 1972 (McCaskie 1973a) and between Oxnard and Santa Barbara Is. in August - September 1974, where it was "reasonably common and widespread" (McCaskie 1975a). It has been found singly and in flocks of 600-3,000 (McCaskie 1971a), often in company with Black or Leach's Storm-Petrels.

Least Storm-Petrels generally forage well offshore and scant information is available concerning diet. Anthony (1898) maintains that the birds depend "almost entirely" on larval spiny lobster (Panulirus sp.) off Baja California, but they probably utilize other neuston as well (Scott 1974).

Least Storm-Petrel (continued)

1975-76 Baseline Data

One record, see Vol. III, p. III-597.

Red-billed Tropicbird (Phaethon aethereus)

The Red-billed Tropicbird is found in warmer waters of the eastern Pacific, southern Atlantic and Indian Oceans, with breeding areas located in each. In the eastern Pacific, the birds nest in crevices and holes on islets in the Gulf of California to northern South America. The young appear to disperse farther than the adults, which are found in the vicinity of nesting grounds all year. Like all tropicbirds, the Red-billed Tropicbird is solitary, wide-ranging and truly pelagic for most of the year; no seasonal migration patterns have yet been detected (Palmer 1962).

In southern California, the species is a "rare, irregular post-breeding visitor from June to October" (Small 1974). There is one spring record for 1 May, and two birds overwintered in Santa Barbara in 1954-55 (Small 1974). Pyle and DeLong (1968 ms) state that the Red-billed Tropicbird remains primarily in near-shore (continental) waters; most southern California records are from near San Clemente Is. (Grinnell and Miller 1944, McCaskie 1969a, 1971a, 1976a), although more northerly sightings (to Morro Bay) have been reported (McCaskie 1970a, 1974a).

Little specific information exists on foods utilized by this species, although fish and squid apparently form the bulk of its diet. The birds hover and dive, tern-like, for their prey which is caught transversely in the bill, never speared or stabbed (Palmer 1962).

1975-76 Baseline Data

April - May 1975. None recorded.

June 1975. One bird was seen along the Santa Rosa-Cortés Ridge 59 km northwest of San Nicolas Is. on the 19th. Four more were recorded

Red-billed Tropicbird (continued)

between 27 and 30 June just west of Tanner and Cortés Banks (Fig. III-A4-286).

July 1975. None recorded.

August 1975. On 29 August one Red-billed Tropicbird was seen near the southeastern end of San Clemente Is. (Fig. III-A4-286).

September 1975. One record near Tanner Bank on 11 September and one near the south end of San Clemente Is. on 12 September (Fig. McCaskie (1976) also reports that a California Field Ornithologists' pelagic trip encountered four at the south end of San Clemente Is. on the 13th.

October 1975 - March 1976. None recorded.

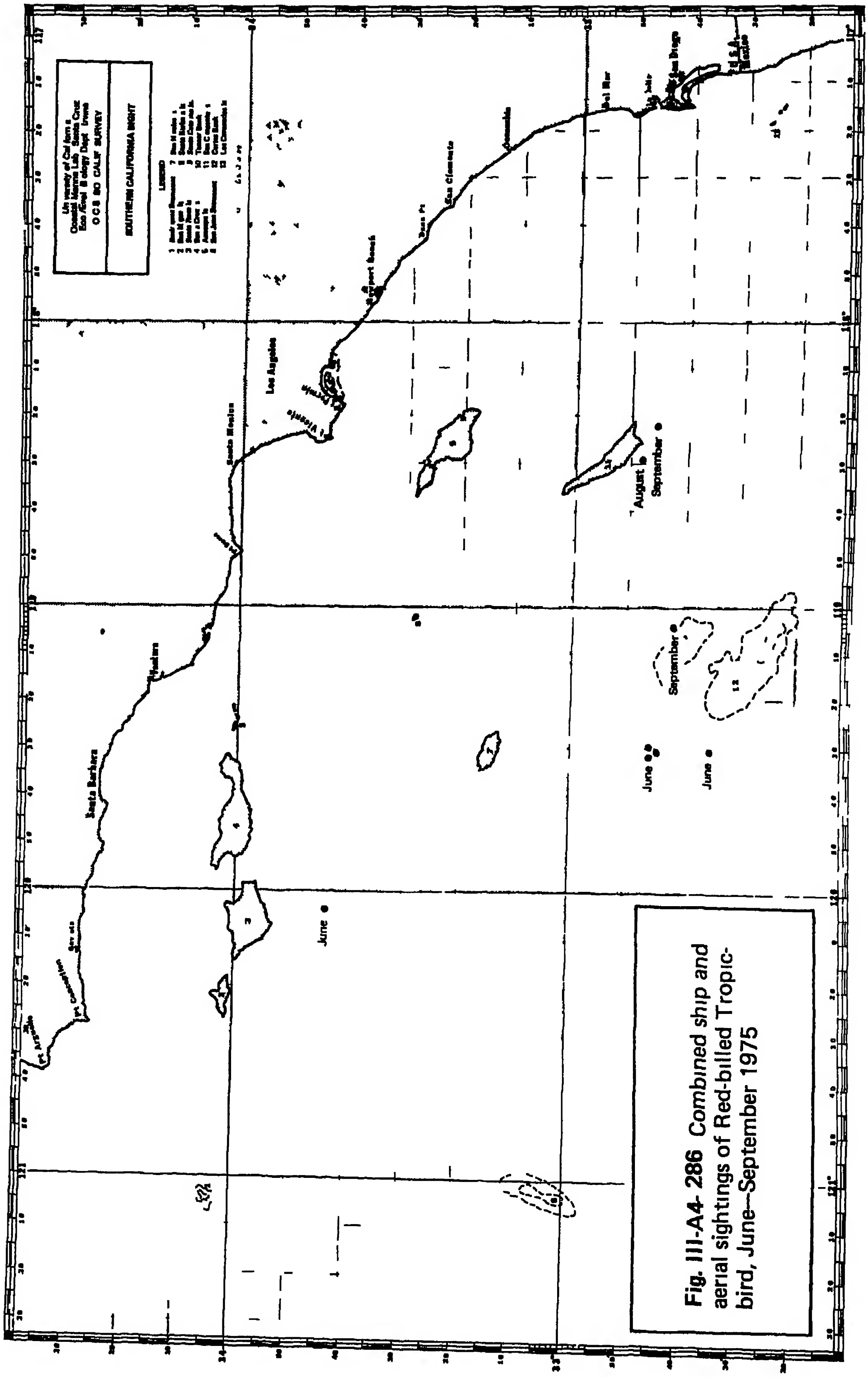


Fig. III-A4-286 Combined ship and aerial sightings of Red-billed Tropicbird, June—September 1975

Brown Pelican (<u>Pelicanus occidentalis</u>)

This species ranges from southern British Columbia, Canada, south along the Pacific coast to southern Chile and, on the East Coast, from North Carolina and the Gulf Coast of the United States southward to British Guiana (A.O.U. 1957). The subspecies in southern California (*P. o. californicus*) nests from the Channel Islands of California south along the Pacific coast of Baja California and in the Gulf of California south to the Tres Marias Islands off Nayarit (A.O.U. 1957). In the Channel Islands, Brown Pelicans presently nest on Anacapa Is., and occasionally on Scorpion Rk., Santa Cruz Is. The species has historically nested on several of the other islands in the Southern California Bight (Appendix III-A3).

During summer and autumn, pelicans disperse into California waters from Mexican nesting colonies; many traveling beyond Pt. Conception, reaching Monterey Bay in maximum numbers in October and returning southward in December (Ainley 1972; Baldridge 1973). They have been recorded as far north as British Columbia. Apparently, birds from Mexican waters pass southward out of the southern California area by December (Anderson and Anderson 1976), leaving behind only the breeding residents of the Channel Islands.

Most of the available information on Brown Pelican distribution in the fall and winter months comes from shore counts; their distribution in the open-ocean waters of southern California is largely unknown.

Brown Pelicans are known for natural fluctuations in the use of nesting sites, however, in California there has been a gradual withdrawal from northern nesting sites and very poor reproductive success in the Bight (Gress 1970, Schreiber and Risebrough 1972, Jehl 1973a, Anderson and

Anderson 1976). Both factors led to designation of this bird as an "endangered species" by the U.S. Department of the Interior.

Anderson and Anderson (1976) have summarized the available information on pelican dispersal, food habits, and population history. They concluded that a long-term population decline that began 20 years ago has been the result of environmental pollution, specifically the accumulation of persistent organochlorine pesticide residues, and perhaps, also, fluctuations in important environmental features related to availability of pelican's primary prey -- small schooling fish, such as anchovies (Engraulis), and sardines (Sardinops). Superimposed upon this decline was a series of short-term oscillations in reproductive output, probably related in great extent to the seasonal temperature characteristics of waters of the California Current and Southern California Countercurrent.

Little specific information on the foods of the California subspecies exists, although Sefton (1927) gives an account of Brown Pelican foraging on schools of smelt, and scavenging. On the basis of examining foods regurgitated by young pelicans during banding on Anacapa Is. from 1972-1974, Anderson et al. (1975) concluded that northern anchovies (Engraulis mordax) are the mainstay of the pelicans' diet in southern California.

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are presented on pp. III-521-523.

Brown Pelican (continued)

1975-76 Baseline Data

April 1975. None were found at sea in mid-April. Two were recorded during beach walks in mid-month, both at McGrath State Beach.

May 1975. Counts on mainland and Santa Cruz Is. beaches revealed a total of 58 birds, almost all of which were found on Santa Cruz Is. (Table III-A4-166). Sightings at sea were of single birds 8 and 15 km southwest of Dana Pt. and 30 km west of Oceanside on the 7th, and another 12 km northwest of Santa Catalina Is. on the 9th.

June 1975. Single birds were recorded in Anacapa Passage, 28 km south of Pt. Mugu, and 12 km west of Newport Harbor on the 29th. They were found in fairly large numbers on San Miguel, Santa Cruz, and Anacapa Islands, and McGrath and Pt. Mugu State Beaches, but were scarce elsewhere (Tables III-A4-166, 167). The colony on Scorpion Rk., Santa Cruz Is. harbored a total of 305 individuals of mixed ages, the highest count from island shores recorded on the June flights.

July 1975. Numbers on island and mainland beaches were similar to those in the preceding month (Tables III-A4-166, 167) and there was a clear numerical predominance of immature birds over adults (95% of birds at McGrath S.B. and 80% on Santa Cruz Is.). An influx of birds was recorded in open-ocean waters during cruises in mid- and late-July (Fig. III-A4-287). Birds were found in moderate to low densities throughout our survey area except along the western margin of Santa Cruz Basin and inshore along the Orange County coast.

August 1975. Numbers declined at sea in early August (Fig. III-A4-288), with the area from Santa Barbara Is. to Santa Monica Bay harboring the largest number of birds. Pelicans were not found at sea south of the northern islands (except Anacapa Is.), nor along the Santa Rosa-Cortés Ridge.

Table III-A4-166. Frequency of sightings of Brown Pelicans. (total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	2	-	0	-	-	0	-	0	0	2
11-24 May	10	2	42	2	-	2	0	0	0	0	0	0	58
13-19 June	19	38	0	106	-	23	2	0	0	0	0	5	193
11-18 July	40	19	49	120	1	16	0	7	0	0	10	1	263
1-7 August	69	29	0	59	105	0	1	0	0	0	0	11	274
11-18 September	22	85	71	135	273	23	53	0	0	8	-	-	670
15-18 October	18	0	13	305	259	17	35	4	1	2	-	-	654
6-14 November	10	11	8	77	79	0	145	2	3	20	5	0	360
4-11 December	2	133	24	58	0	0	386	24	0	2	3	0	632
11-18 January, 1976	1	2	3	2	9	0	0	22	0	0	0	0	39
16-24 February	2	6	5	0	3	0	1	0	0	0	0	0	17
11-22 March	6	0	4	5	0	1	1	1	0	0	13	0	31

Table III-A4-167.

Frequency of sightings of Brown Pelicans (total individuals)on and near Channel Island beaches, April 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Location / Date→ / Type→	16-17 May 75 Air	27-30 Jun 75 Air	14-18 Jul 75 Ship	4-7 Aug 75 Air	23-26 Oct 5 Air	22-23 Jan 76 Air	12-14 Mar 76 Air
SAN MIGUEL IS.							
Richardson Rk. (103)	-	0	-	0	18	0	0
West (102,110-20,160,170)	-	20	-	4	183	11	1
South (146-51)	-	0	-	0	2	0	0
East (101,140-45)	-	28	-	98	925	10	0
North (121-40)	-	175	-	135	15	0	0
SANTA ROSA IS.							
West (611-12,625)	-	5	4	0	12	0	0
South (620-24)	-	0	0	6	0	2	0
East (618-19,629)	-	38	0	44	30	2	0
North (610,613-17)	-	27	20	6	86	0	0
SANTA CRUZ IS.							
West (641,658)	-	0	0	116	82	2	0
South (650,653-56)	-	7	0	212	232	32	0
East (649,651)	-	305	2	211	909	153	15
North (640,643-48)	-	70	241	119	229	27	0
ANACAPA IS. (660-80)	-	270	452	-	-	-	-
SAN NICOLAS IS.							
Northwest (210-60)	-	0	-	128	519	91	0
Southwest (203)	-	0	-	0	10	0	0
Southeast (202)	-	0	-	0	134	5	0
Northeast (201)	-	0	-	0	50	0	0
SANTA BARBARA IS.(300-330)	-	60	-	234	1460	109	3
SANTA CATALINA IS.							
Northwest (506-07,515, 525-27)	0	0	-	10	9	9	-
Southwest (503-05,529)	0	0	-	-	3	7	-
South (502,523-24)	0	0	-	-	1	3	-
East (501,509-11)	1	0	-	-	0	0	-
Isthmus (508,521-522)	0	0	-	-	4	82	-
SAN CLEMENTE IS.							
Northwest (409-11)	10	17	26	346	553	769	40
West Central (406-08)	0	0	10	27	238	103	7
Southwest 404-05)	0	0	14	0	0	0	0
Pyramid Cove (402-03)	0	0	1	0	2	0	-
East 401,412)	0	0	7	-	-	-	-

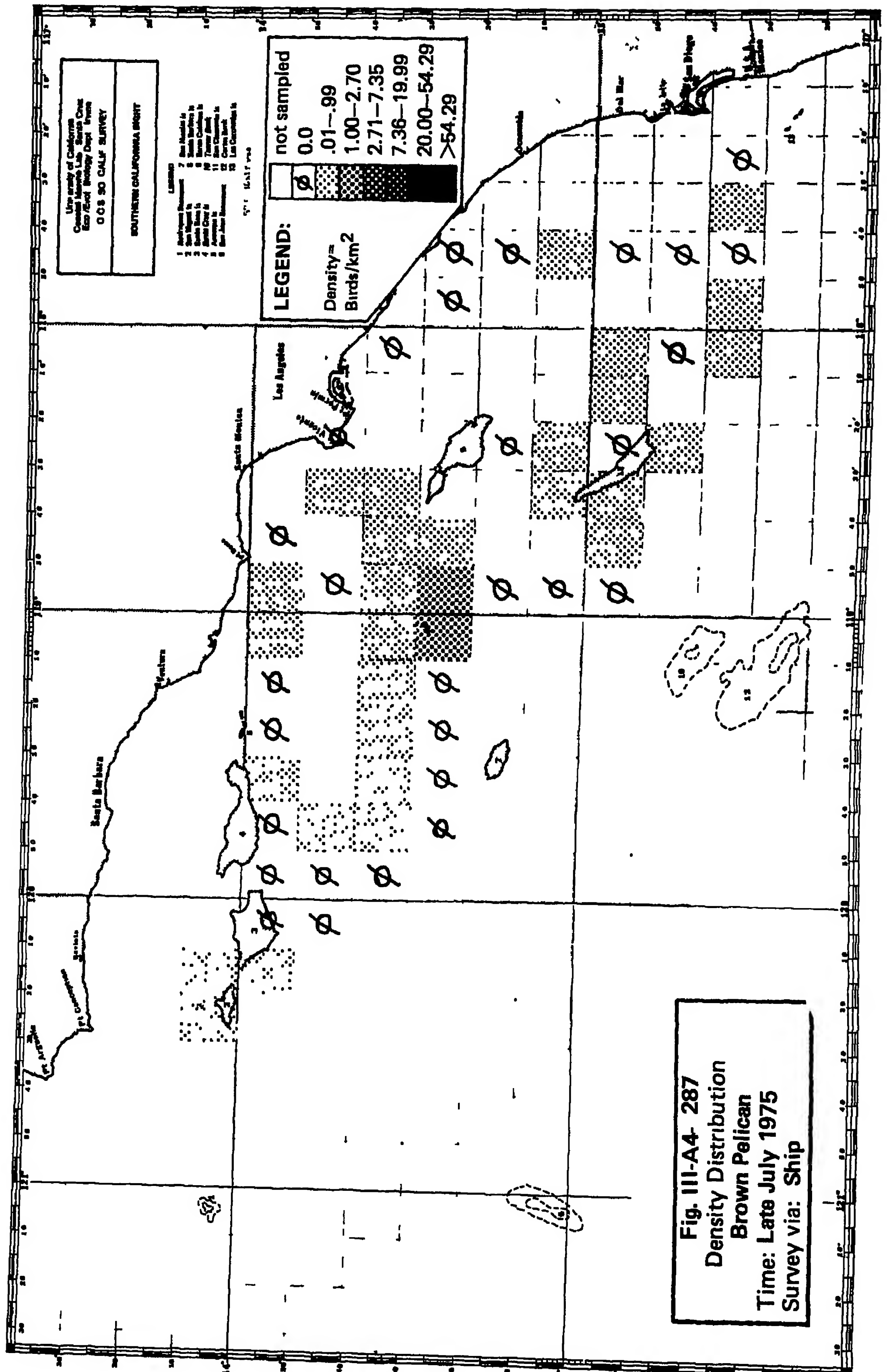


Fig. III-A4- 287
Density Distribution
Brown Pelican
Time: Late July 1975
Survey via: Ship

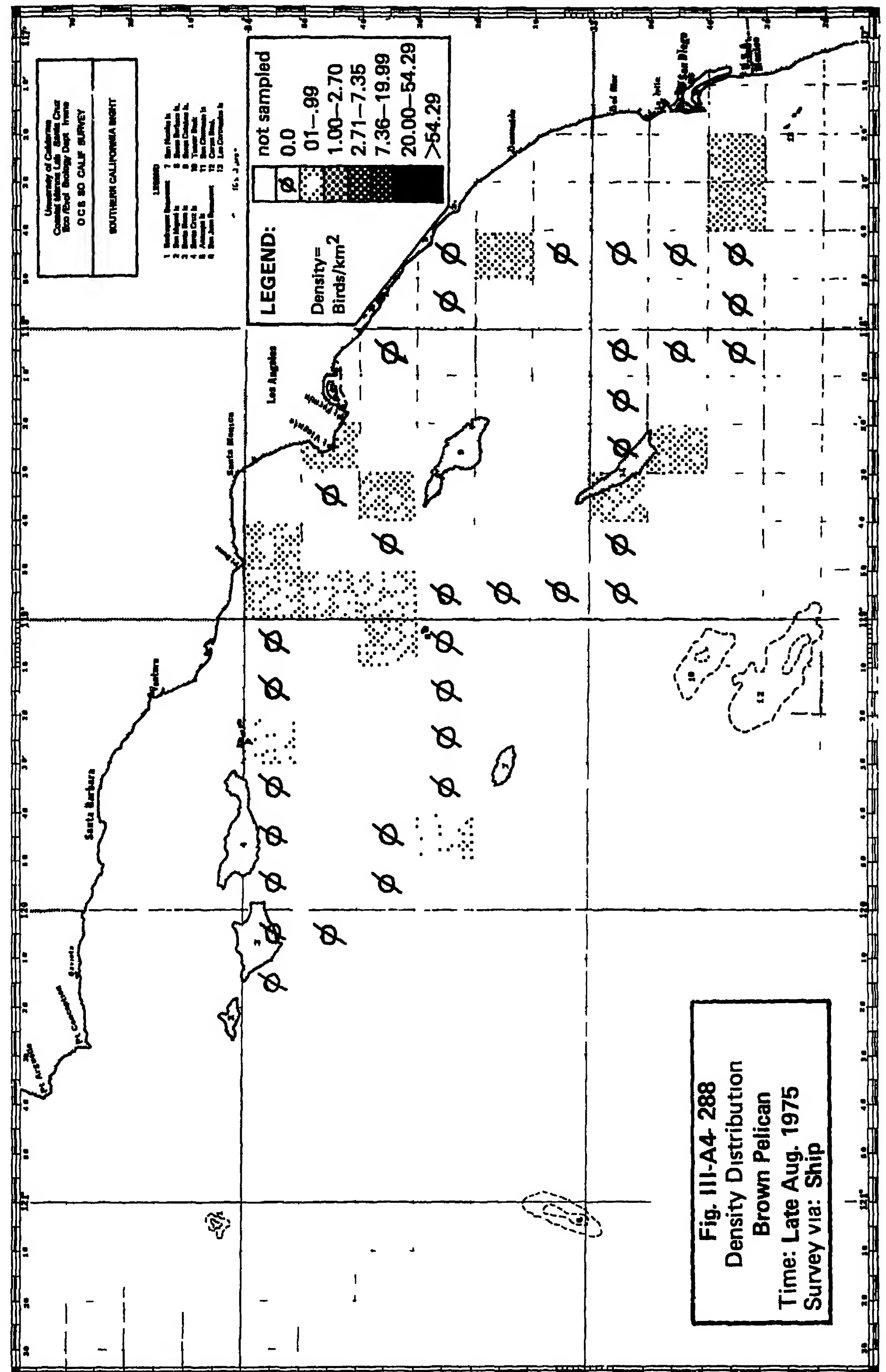


Fig. III-A4- 288
Density Distribution
Brown Pelican
Time: Late Aug. 1975
Survey via: Ship

Brown Pelican (continued)

Substantial numbers were found close inshore among the islands, however, with high counts of 658 at Santa Cruz Is. and 373 at San Clemente Is. (incomplete count) (Table III-A4-167). Total numbers and distribution of birds recorded on beach counts in early August were similar to those from July (Table III-A4-166). As in the previous month, a larger relative percentage of immatures was found on the mainland (53% at McGrath S.B.) than on Santa Cruz Is. (39% of the totals on six beaches).

September 1975. The total number recorded on beach walks in mid-September was considerably greater than those of the preceding several months (Table III-A4-166), reflecting concentrations at McGrath S.B. and P.M.T.C., Pt. Mugu. This was the highest total beach count of the year (670 birds). Immature birds comprised from 74 to 97% of the totals on mainland beaches but only 20% on Santa Cruz Is. beaches.

Substantial numbers were found in open-ocean waters in mid- to late September (Fig. III-A4-289). The only areas that were devoid of pelicans were the Santa Rosa-Cortes Ridge (except at San Nicolas Is.), and San Pedro Channel. There was a weak tendency for pelicans to concentrate in the area from Anacapa Is. to Santa Barbara Is.

October 1975. Brown Pelicans were found in relatively large numbers during aerial surveys over open water late in the month (Fig. III-A4-290). Major concentrations were found northwest of San Miguel Is., east and south of Santa Cruz and Anacapa Islands, and near Santa Barbara and Santa Catalina Islands. None were seen far offshore. These large numbers at sea were paralleled by very high numbers inshore along island shores, where a total of 5,704 birds were seen and photographed from the air (Table III-A4-167). More than 1,000 birds each were found at San

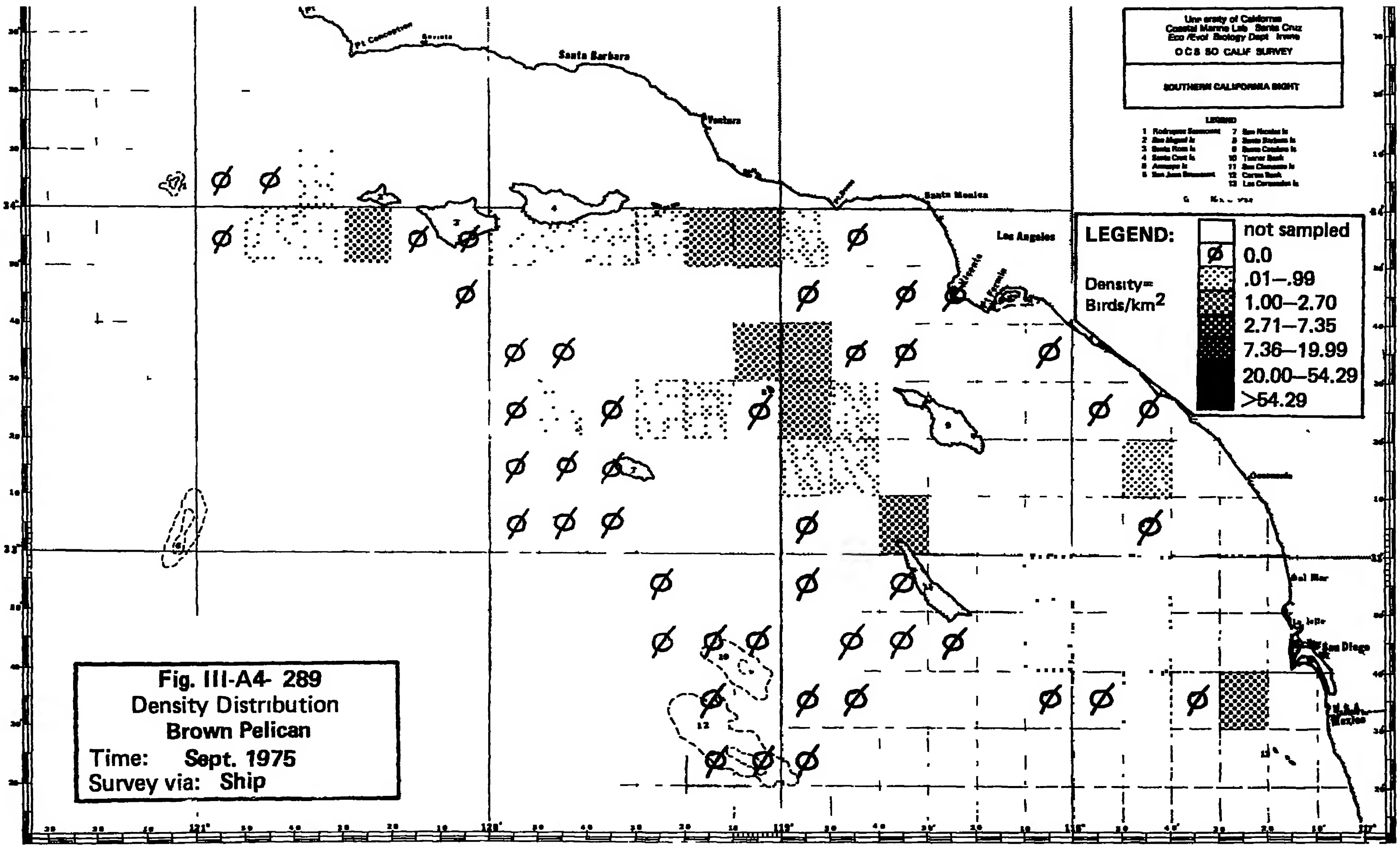


Fig. III-A4- 289
Density Distribution
Brown Pelican
Time: **Sept. 1975**
Survey via: **Ship**

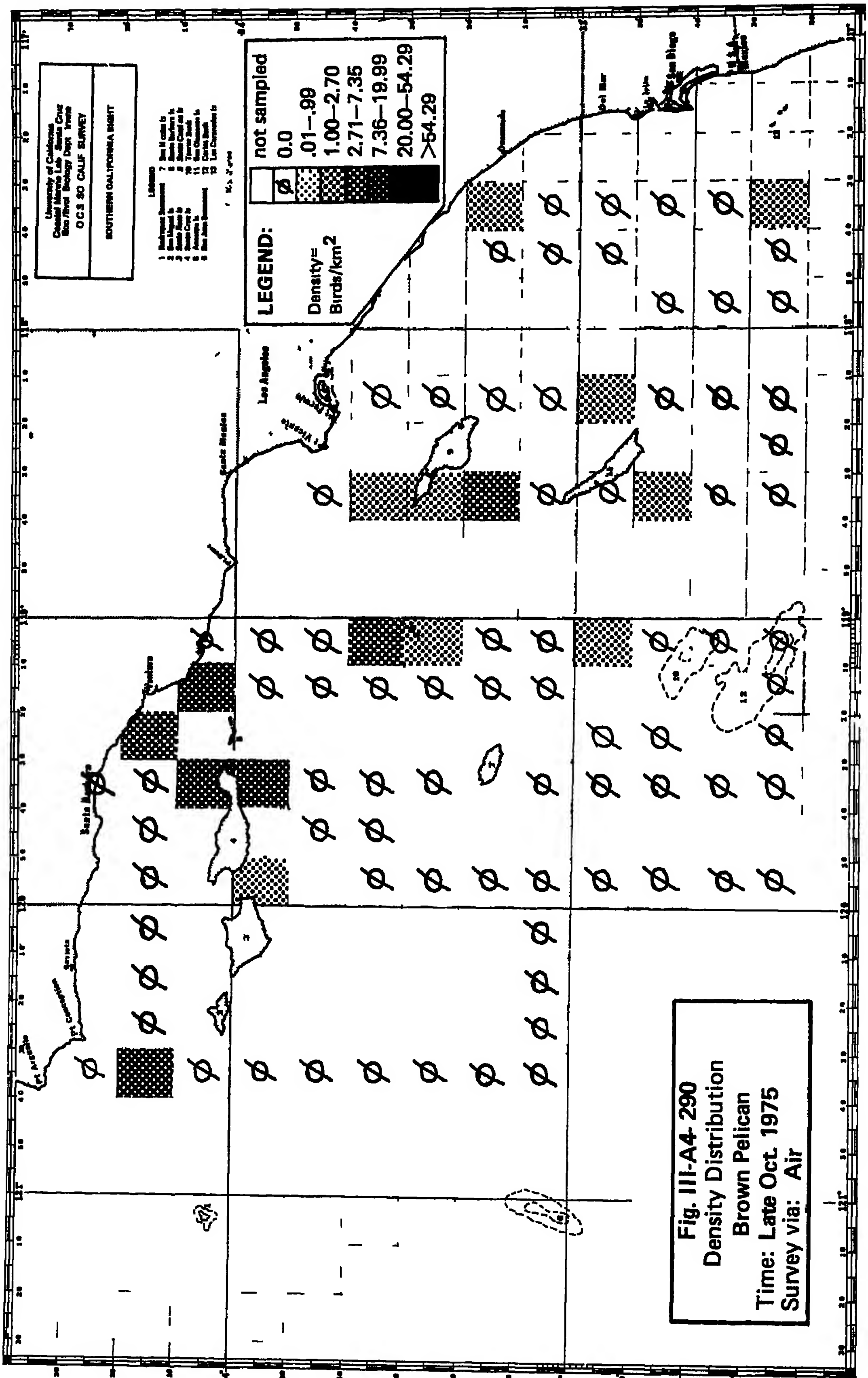


Fig. III-A4-290
Density Distribution
Brown Pelican
Time: Late Oct. 1975
Survey via: Air

Brown Pelican (continued)

Miguel, Santa Cruz, and Anacapa Islands. Numbers encountered during beach walks in mid-month were similar to those recorded in September; once again, the high counts were from McGrath S.B. and P.M.T.C., Pt. Mugu. In contrast to the age distribution at Santa Cruz Is. beaches, where 80% of the total count were adult birds, immatures comprised 89% of the birds at P.M.T.C., Pt. Mugu.

November 1975. Total numbers at sea in mid-November were quite high; most birds were found south and east of Santa Barbara Is. (Fig. III-A4-291). This distribution was noteworthy in its dissimilarity to that of the previous several months. Heavy seas and strong winds in offshore portions of the November cruise track may have contributed in this regard, forcing birds to seek the more sheltered waters inshore of the eastern islands.

Numbers of pelicans ashore had declined considerably by the time mid-November beach counts were made (Table III-A4-166). Not surprisingly, many more birds were found on Orange and San Diego County beaches than in the preceding six months. As usual, immature birds comprised a much larger proportion of the populations on the mainland than on Santa Cruz Is.

December 1975. Numbers of Brown Pelicans observed during aerial censuses in mid-month were considerably below those seen in October and November (Fig. III-A4-292). Birds were scattered through the eastern and southern portions of the Bight (primarily near shore) but were scarce in the west. Beach walk data corroborate the trend seen at sea; numbers were fairly high at Santa Cruz Is. and McGrath S.B., none were seen at several central and southern beaches, though a surprising 386 were found at Dockweiler S.B. (Table III-A4-166). Fifty-eight percent of the birds at the latter site were immature, whereas no young birds were seen on Santa Cruz Is.

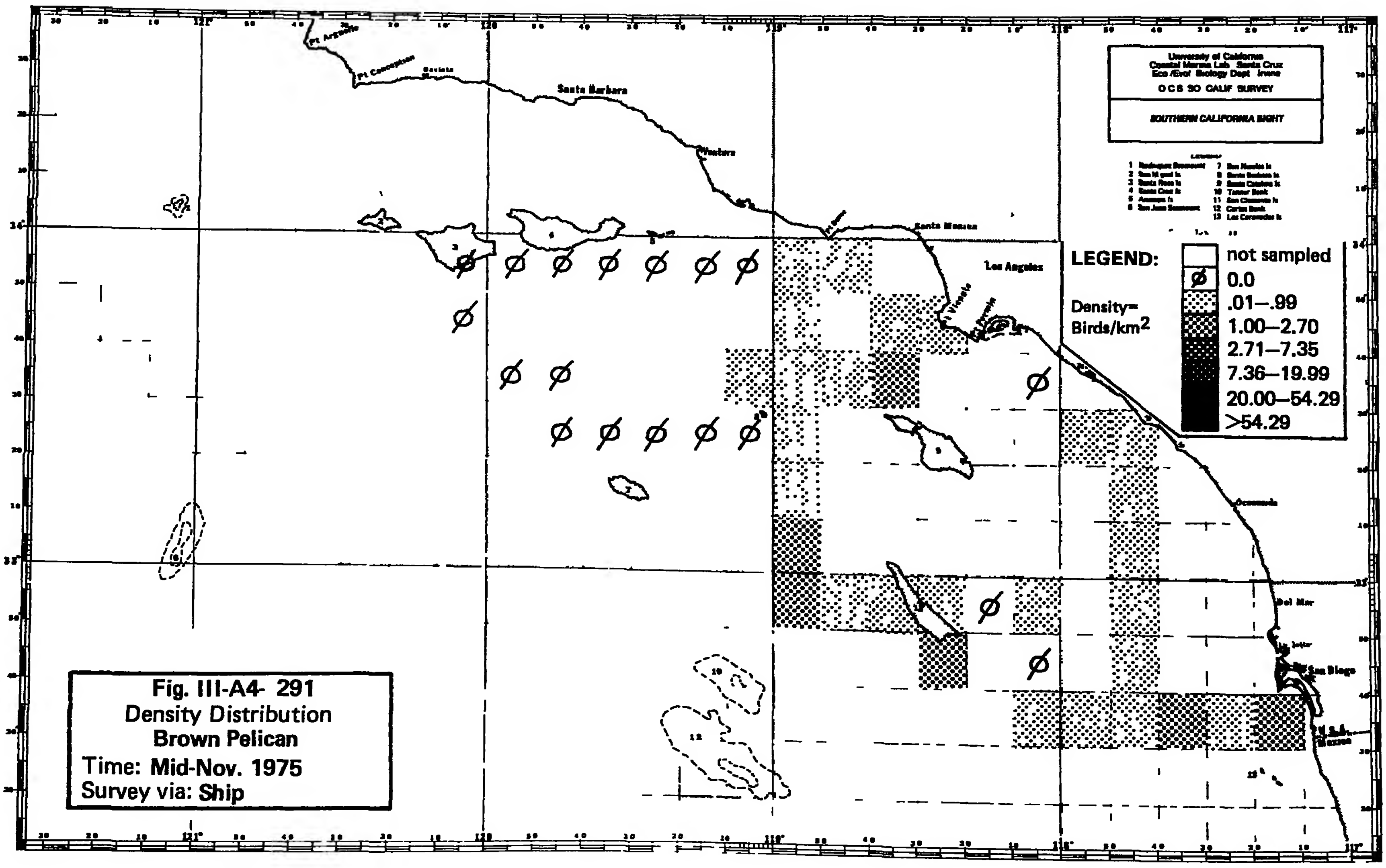


Fig. III-A4- 291
Density Distribution
Brown Pelican
Time: Mid-Nov. 1975
Survey via: Ship

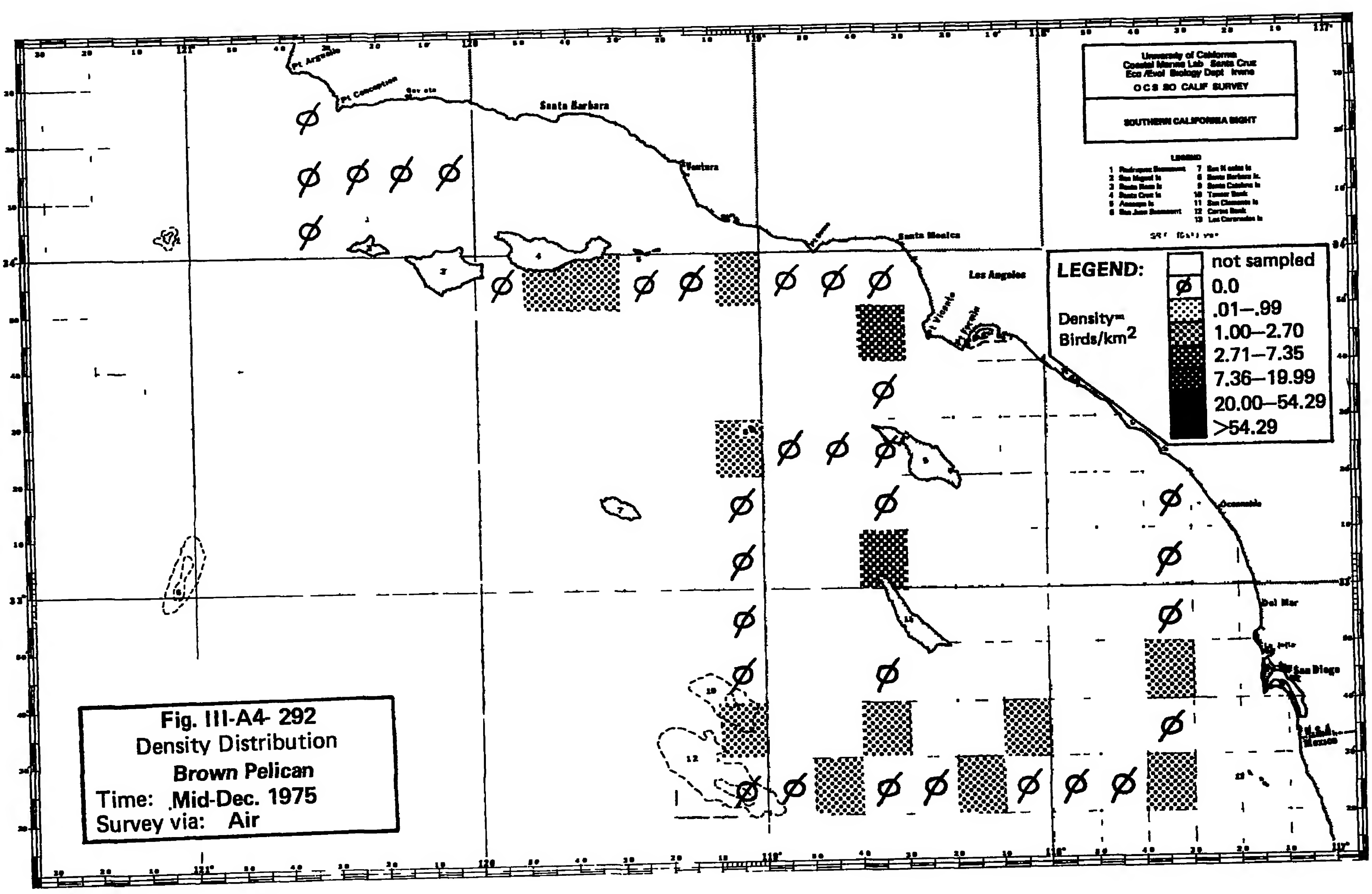


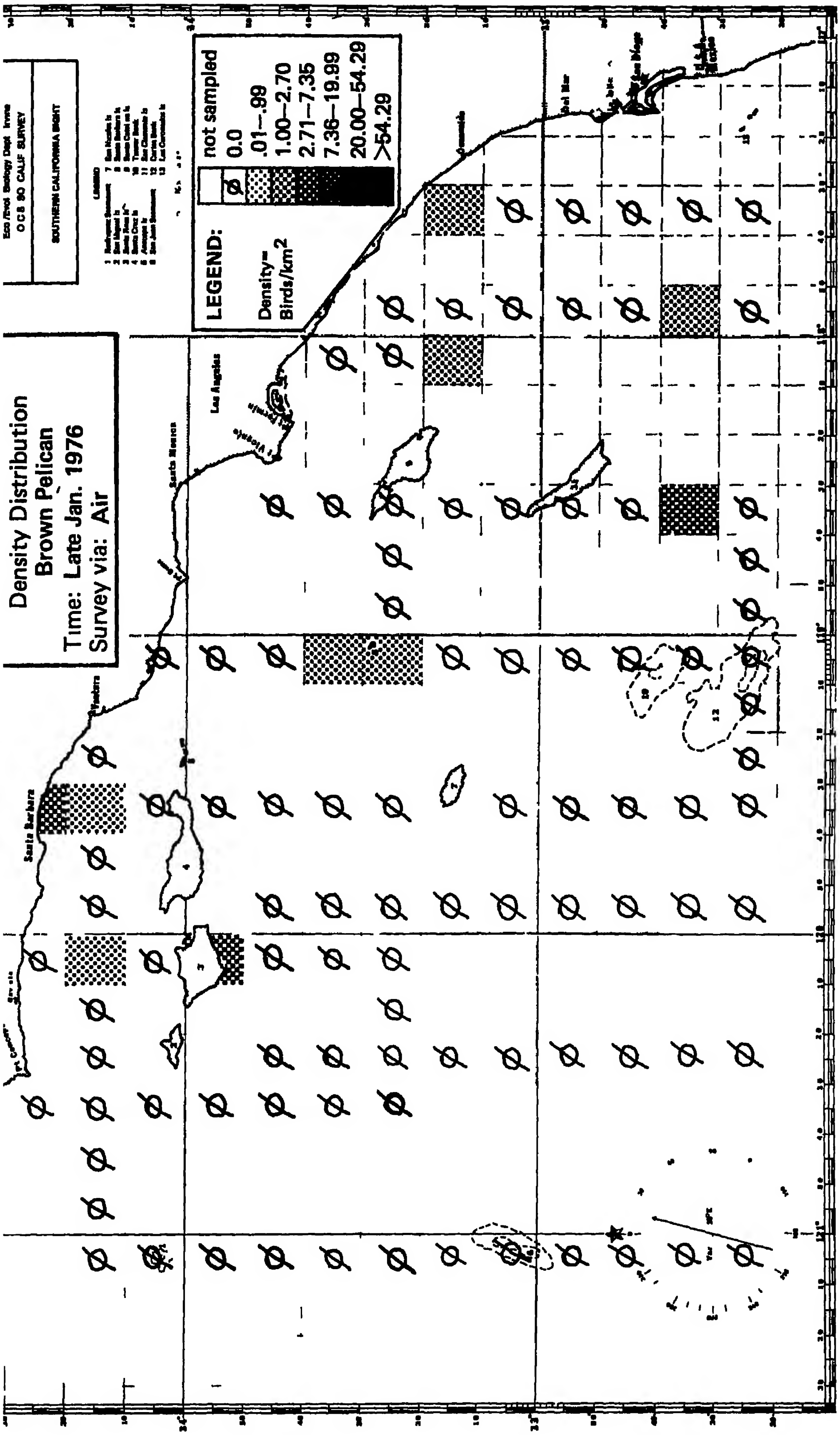
Fig. III-A4- 292
Density Distribution
Brown Pelican
Time: Mid-Dec. 1975
Survey via: Air

Brown Pelican (continued)

January 1976. Few pelicans were counted onshore during mid-January beach walks (Table III-A4-166); the only sizeable numbers were found at Huntington S.B. Aerial counts around all of the islands except Anacapa Is. showed that only Santa Cruz, Santa Barbara, Santa Catalina, and San Clemente Islands harbored more than 100 birds, the latter having the high count of 872 (Table III-A4-167). At the same time, aerial censuses revealed Brown Pelicans at scattered inshore and island locations (Fig. III-A4-293). Most birds were either found in Santa Barbara Channel or south and east from Santa Barbara Is.

February 1976. Beach counts again found few pelicans; most were on Santa Cruz Is. beaches (Table III-A4-166). The species was equally scarce at sea and most birds were found within a few km of the mainland or island roosts (Fig. III-A4-294).

March 1976. Aerial counts in mid-month showed that pelicans had almost completely withdrawn toward the eastern islands and the colony sites at Santa Cruz and Anacapa Islands (Table III-A4-167). A single bird, 12 km southwest of Ventura, was the only sighting in open-ocean waters. Only 31 birds were recorded in mid-month during beach censuses, most at either Santa Cruz Is. (other than Scorpion Rk.) or Silver Strand S.B. (Table III-A4-166).


Density Distribution
Brown Pelican
Time: Late Jan. 1976
Survey via: Air
LEGEND:
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Density=
Birds/km2
Los Angeles
Santa Monica
Santa Barbara
Oceanside
Del Mar
San Diego

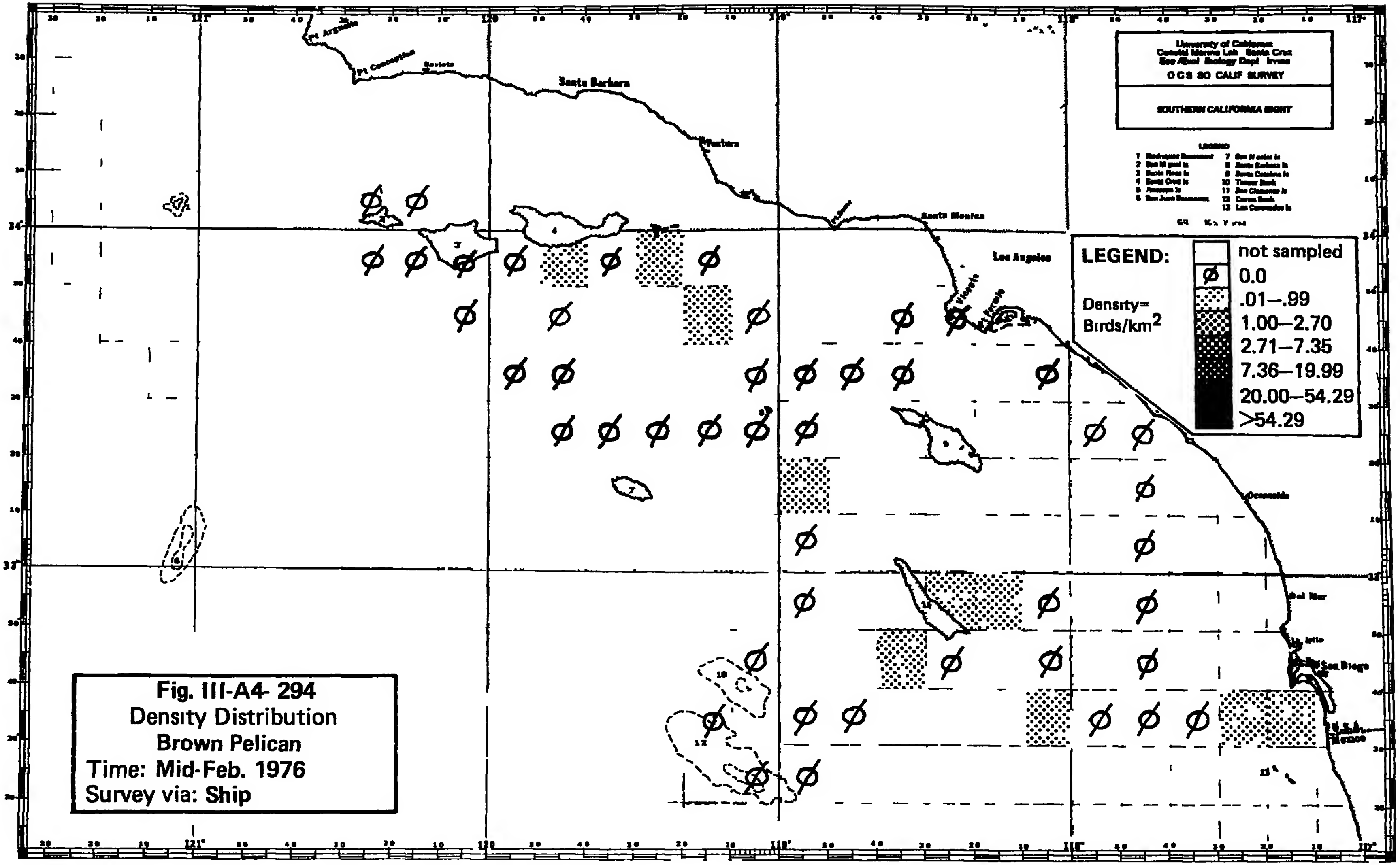


Fig. III-A4- 294
Density Distribution
Brown Pelican
Time: Mid-Feb. 1976
Survey via: Ship

Double-crested Cormorant (*Phalacrocorax auritus*)

This is the largest cormorant found on the west coast of the United States, and the only one that nests at inland sites. Several subspecies are recognized; the Pacific coastal form (*P. a. albociliatus*) nests from British Columbia south to the Gulf of California and inland to the Great Basin (A.O.U. 1957). It is mostly sedentary on the California coast, but some altitudinal migration occurs among birds that nest in inland areas receiving considerable snowfall (Palmer 1962). This is the cormorant species most likely to be encountered in estuaries and quiet bays on the California coast.

Double-crested Cormorants nest on a few of the Channel Islands, though in much smaller numbers than in the early years of this century (Howell 1917, Willett 1933). Gress et al. (1973) have documented and correlated a major decline of nesting populations of this species in southern California and northwestern Baja California with reduced reproductive output, eggshell thinning, and high concentrations of chlorinated hydrocarbon residues in egg lipids. The current status of nesting colonies in southern California is discussed on pp. III-628 to 631.

Double-crested Cormorants feed on a variety of fish and invertebrate prey; smelt, flounder, sculpin, sardines and surf perch are often taken in west coast waters (Bartholomew 1942, Palmer 1962).

Information concerning the historical breeding status of this species is included in Appendix III-A3.

Double-crested Cormorant (continued)

1975-76 Baseline Data

April 1975. Nine birds recorded, all on Santa Cruz Is. (Table III-A4-168).

May 1975. None were found on beaches or at sea.

June 1975. Only one bird was recorded during mid-month beach walks; it was the only sighting for the year at Dockweiler S.B. Aerial and ship surveys inshore around the islands yielded sightings of 11 birds as follows: one at Castle Rk., San Miguel Is.; two on the south coast of Santa Cruz Is.; eight on Anacapa Is. These sightings were presumably of nesting birds. No Double-crested Cormorants were found offshore.

July 1975. Three birds off the north shore (Arch Rk. and Chinese Harbor) of Santa Cruz Is., and two more on West Anacapa Is., were the only sightings this month.

August 1975. None were found on the islands, despite the likelihood that some birds were still nesting at this time. One bird was seen at Border Field S.B. Three were found 2 - 4 km east of San Clemente Is. on the 29th.

September 1975. Ship surveys in mid- and late-September yielded a single sighting; one bird found approximately 35 km east of Pyramid Cove, San Clemente Is. on the 26th. Beach censuses in mid-month resulted in records of 42 Double-crested Cormorants (Table III-A4-168). Almost all were at the west end of Santa Cruz Is. and at P.M.T.C., Pt. Mugu.

October 1975. None recorded.

November 1975. A total of 11 birds was recorded, most at McGrath S.B. (Table III-A4-168). None were found at sea.

December 1975. Two birds on mainland beaches (McGrath S.B. and P.M.T.C., Pt. Mugu) and one bird 2 km south of Pt. Fermin.

(total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	8	1	0	-	0	-	-	0	-	0	0	9
11-24 May		None	recorded.										0
13-19 June	0	0	0	0	-	0	1	0	0	0	0	0	1
11-18 July		None	recorded.										0
1-7 August	0	0	0	0	0	0	0	0	0	0	0	1	1
11-18 September	1	29	0	0	11	0	0	0	1	0	-	-	42
15-18 October		None	recorded.								-	-	0
6-14 November	2	0	0	9	0	0	0	0	0	0	0	0	11
4-11 December	0	0	0	1	1	0	0	0	0	0	0	0	2
11-18 January, 1976	0	0	0	4	0	0	0	0	0	0	0	0	4
16-24 February	2	8	1	0	7	1	0	0	0	0	0	0	19
11-22 March	0	4	0	0	6	0	0	0	1	0	0	0	11

Double-crested Cormorant (continued)

January 1976. Four were seen at McGrath S.B., the only mainland record. Three birds were counted on the south coast of San Miguel Is.; one at Beecher's Bay, Santa Rosa Is.; eight and two on the south and east coasts, respectively, of Santa Cruz Is.; and a total of 31 were found around Anacapa Is. The only record at sea was of one bird 2 km southeast of Prince Is.

February 1976. Birds were scattered in low numbers on Santa Cruz Is. and mainland beaches (Table III-A4-168) during counts conducted from 16 to 24 February. Among the islands, we found one bird near Crook Pt., and one at Castle Rk., San Miguel Is., two on the south coast of Santa Rosa Is., 37 scattered along the south coast of Santa Cruz Is., five at Anacapa Is., and 19 on the east side of Santa Catalina Is. The latter sightings were of birds feeding on squid a few hundred meters off the beach.

March 1976. Seven found on mainland beaches in mid-March (Table III-A4-168). Inshore surveys revealed five birds at Prince Is., two and one on the south and east coasts, respectively, of Santa Rosa Is., four and nine on the west and south coasts of Santa Cruz Is., and eight at Anacapa Is. None were found at sea.

Brandt's Cormorant (<u>Phalacrocorax penicillatus</u>)

Brandt's Cormorant is largely sedentary within its nesting range. It occurs from Vancouver Island, British Columbia, to Baja California and the Sea of Cortés (A.O.U. 1957, Gabrielson and Lincoln 1959). It is by far the most abundant cormorant nesting in the Southern California Bight; colonies have been found on all eight Channel Islands (Howell 1917, Willett 1933).

This species wanders farther out to sea than either of the other resident cormorants (Pelagic and Double-crested) but is generally found within 5 km of an island or mainland coast (Grinnell and Miller 1944, Scott 1973).

Foods include a variety of fish species, with both mid-water schooling and benthic types taken, depending on location and availability of potential foods (Palmer 1962, Hubbs et al. 1970, Scott 1973).

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are summarized on pp. III-533 and 628-633.

1975-76 Baseline Data

<u>April 1975</u>. Two birds found 15 km north of Santa Catlaina Is. on the 21st.

<u>May 1975</u>. One seen 15 km north of Santa Catalina Is. on the 10th; 13 from 2 - 15 km north of Prince Is., and 22 more from 1 - 10 km northwest of Castle Rk., San Miguel Is. on the 13th. Additional ship and aircraft transects failed to reveal any of these birds more than a few km offshore.

Brandt's Cormorant (continued)

Partial aerial survey and beach walks on the coasts of the Channel Islands revealed more than 1,500 birds each on San Miguel and Santa Cruz Islands. These totals included photographic counts of the large cormorant colonies on Castle Rk., Prince Is., and Scorpion Rk. Beach counts on the mainland yielded no sightings.

June 1975. No birds were encountered at distances greater than 2 km from the islands. Beach censuses from 13 through 19 June revealed the presence of a very few Brandt's Cormorants in San Diego Co. beaches; three birds were found at Silver Strand S.B., one at Border Field S.B.

Aerial surveys around the islands late in the month yielded a total count of 5,544 combined Brandt's and large, unidentified cormorants. This included all known nesting colonies and roosts. (Ground and ship counts on the Channel Island colony areas indicated less than 2% of all large cormorants were Double-crested. For this reason, unidentified, large cormorants were assigned to Brandt's.) The largest numbers of individuals were found at San Miguel, Santa Rosa, Santa Cruz and Anacapa islands (Table III-A4-169).

July 1975. Inshore ship surveys from 14 through 18 July found large numbers of Brandt's Cormorants on the north coast of Santa Rosa Is. and relatively few birds at San Clemente Is. (Table III-A4-169). During cruises in mid- to late July, ten were sighted at distances greater than 5 km from shore. One bird each was found 9 km south of Anacapa Passage and 9 km south of Middle Anacapa Is.; two were 26 km and one was 18 km northwest of Santa Barbara Is.; one was 38 km northwest of Los Coronados Is., and four were 39 km west of La Jolla. The latter records were probably of birds commuting between offshore foraging grounds and colonies on San

Table III-A4-169.

requency of sightings of Brandt's and unidentified Cormorants total individuals)on and near Channel Island beaches, April 1975 through arch 1976. Numbers in parentheses refer to specific locations on Figures II-178 through -185. Dash indicates area not surveyed or survey incomplete. sterisk indicates censuses of birds on nesting colonies are included.

Date→	16-17 May 75	27-30 Jun 75	14-18 Jul 75	4-7 Aug 75	23-26 Oct 75	16-18 Dec 75	22-25 Jan 76	11-14 Feb 76	12-14 Mar 76
ocation Type→	Air	Air*	Ship*	Air*	Air	Air	Air	Ship	Air
AN MIGUEL IS.									
Richardson Rk. (103)	-	0	-	221	245	33	50	-	50
West (102,110-20,160,170)	-	899	-	1043	1832	286	272	358	179
South (146-51)	-	741	-	22	539	79	30	63	0
East (101,140-45)	-	1154	-	151	2045	112	48	820	190
North (121-40)	-	97	-	87	421	0	63	170	0
;ANTA ROSA IS.									
West (611-12,625)	-	180	52	49	1186	1117	625	-	19
South (620-24)	-	43	-	54	545	523	1550	383	605
East (618-19,629)	-	107	-	385	278	121	311	-	74
North (610,613-17)	-	579	286	427	955	137	197	-	-
SANTA CRUZ IS.									
West (641,658)	-	88	-	94	411	-	50	-	12
South (650,653-56)	-	165	-	28	210	-	701	551	-
East (649,651)	-	7	-	6	15	-	35	-	58
North (640,643-48)	-	317	8	138	240	-	70	-	142
ANACAPA IS. (660-80)	-	542	3	-	-	-	-	1134	-
SAN NICOLAS IS.									
Northwest (210-60)	-	105	-	375	449	-	441	-	140
Southwest (203)	-	0	-	25	40	-	42	-	14
Southeast (202)	-	0	-	0	1211	-	1209	-	39
Northeast (201)	-	125	-	215	230	-	196	-	14
SANTA BARBARA IS.(300-330)	-	146	-	239	203	110	886	-	192
SANTA CATALINA IS.									
Northwest (506-07,515, 525-27)	0	0	-	15	15	-	29	41	-
Southwest (503-05,529)	7	19	-	0	0	-	40	-	0
South (502,523-24)	0	8	-	1	2	-	43	-	-
East (501,509-11)	2	11	-	0	0	-	21	480	-
Isthmus (508,521-522)	0	17	-	0	0	-	235	80	-
SAN CLEMENTE IS.									
Northwest (409-11)	259	120	100	87	137	116	1026	-	25
West Central (406-08)	9	15	22	67	8	26	54	-	20
Southwest 404-05)	0	6	28	5	10	0	0	-	0
Pyramid Cove (402-03)	4	0	2	0	0	0	-	-	-
East 401,412)	0	3	0	-	-	-	-	-	-

Brandt's Cormorant (continued)

Clemete Is., Islas Los Coronados, or the mainland.

<u>August 1975</u>. Aerial surveys from 4 through 7 August indicated this species was most abundant on the four northern islands and San Nicolas Is. (Table III-A4-169). None were recorded during mainland beach censuses at this time.

Shipboard observers found 27 birds at sea in late August, as follows: eight from 5 to 10 km east of Santa Barbara Is.; twelve 14 km west of Newport; and seven 38 km northwest of Los Coronados Is. The latter records were of birds in the same area in which a single bird was found a month earlier.

<u>September 1975</u>. None were found on mainland beaches in mid-month. This species was found in small to large flocks off several of the islands, along the northern half of the Santa Rosa-Cortés Ridge, and, as in the previous two months, in the Gulf of Santa Catalina (Fig. III-A4-295). One sighting, 50 km southwest of San Clemente Is., was notable in being among the farthest offshore records of the year.

<u>October 1975</u>. Aerial surveys from 23 through 26 October documented a large increase in the number of Brandt's and unidentified large cormorants roosting on the Channel Islands compared with results from August flights. This was particularly evident on San Miguel and Santa Rosa islands (Table III-A4-169), where the combined counts increased from 2,439 in August to 8,046 in October. None were recorded on the mainland, and the only offshore sighting was a bird 22 km south of Pt. Conception.

<u>November 1975</u>. Surveys from shipboard indicated that Brandt's Cormorants were for the most part confined to the vicinity of the islands (Fig.III-A4-296). Three notable offshore records were from 37 km west and 50 km southeast

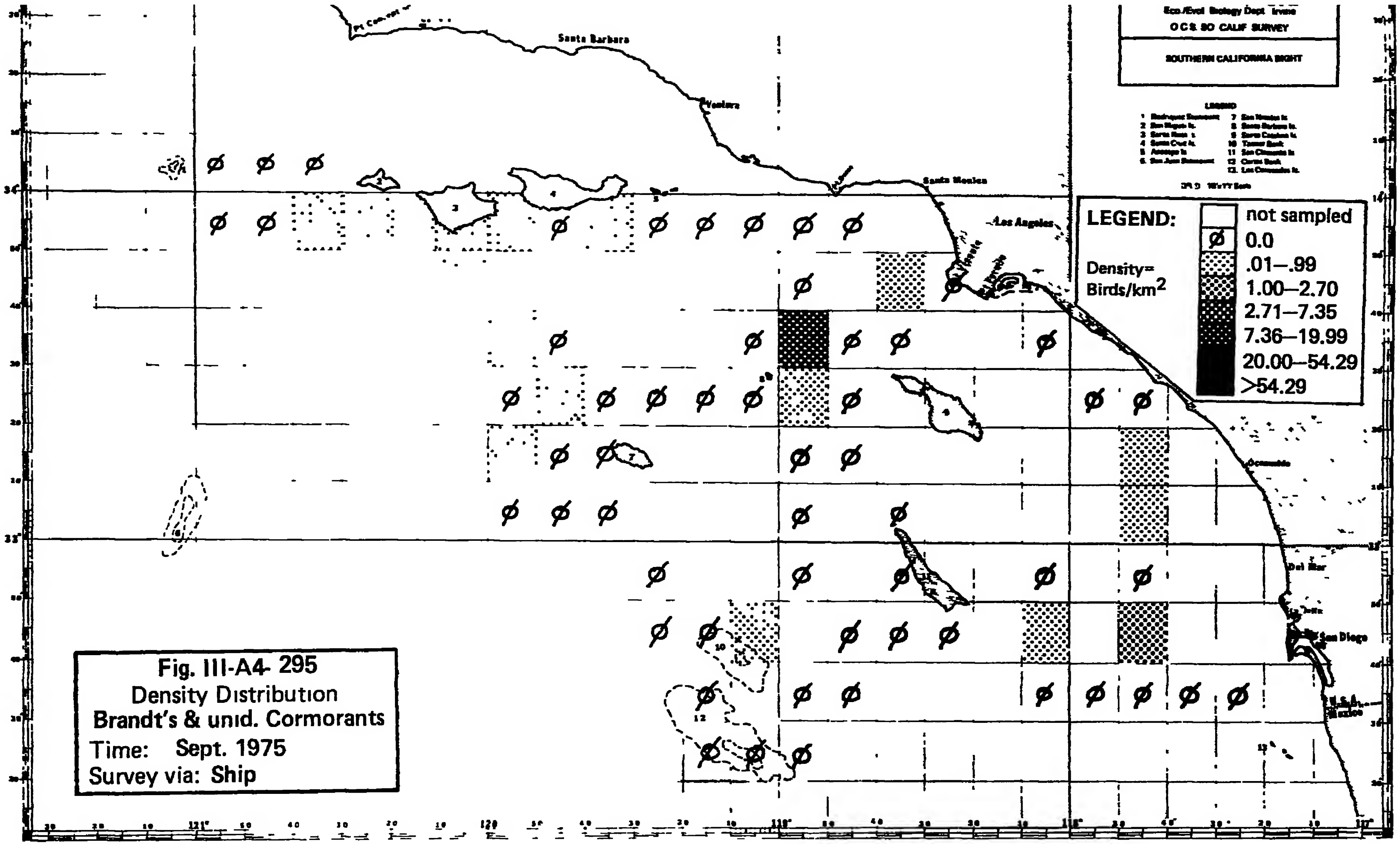


Fig. III-A4- 295
Density Distribution
Brandt's & unid. Cormorants
Time: Sept. 1975
Survey via: Ship

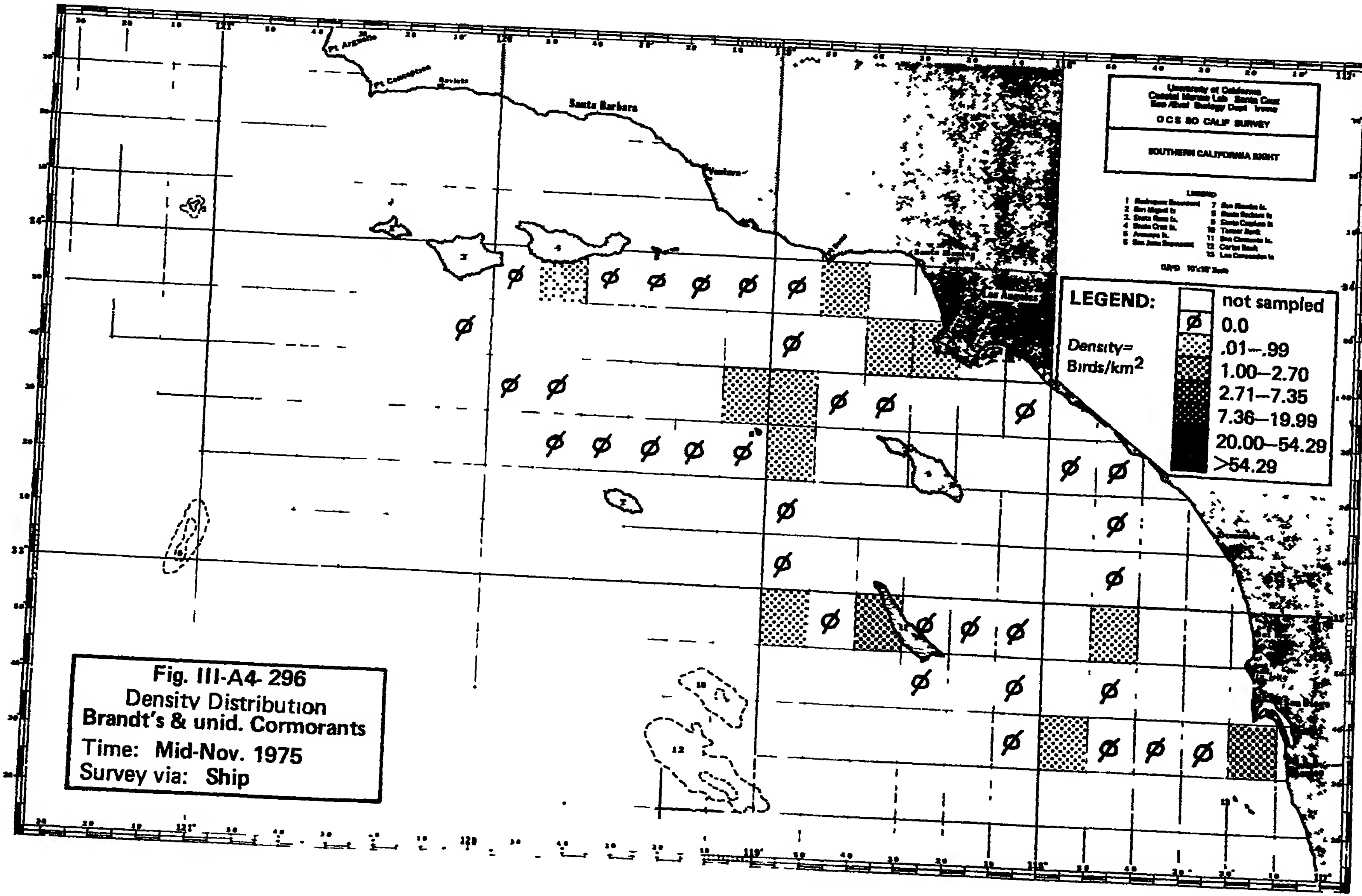


Fig. III-A4-296
Density Distribution
Brandt's & unid. Cormorants
Time: Mid-Nov. 1975
Survey via: Ship

of San Clemente Is. and 45 km northwest of La Jolla.

December 1975. Distribution of this species at sea was similar to that recorded in the previous month (Fig. III-A4-297). A flock of 400 was found 4 km off the east tip of Santa Rosa Is. on the 16th, the largest number recorded away from the immediate vicinity of an island. Partial aerial censuses of the island indicated somewhat smaller numbers on San Miguel and Santa Rosa Islands than in October (Table III-A4-169). None were found on mainland beaches, as was the case for the next 3 months.

January 1976. Aerial and inshore ship censuses around the Channel Islands showed the usual large numbers were present at Santa Rosa, San Nicolas, and Santa Barbara Islands, but, as in December, San Miguel Is. totals were considerably lower than had been found in autumn. Over 1,000 birds were photographed on Bird Rk. in Northwest Harbor, San Clemente Is. (Table III-A4-169). Offshore distribution was little changed from December (Fig. III-A4-298). Cormorants were found in mixed feeding flocks with Brown Pelicans, Northern Fulmars, gulls and loons in eastern Santa Barbara Channel.

February 1976. Brandt's Cormorants were slightly more dispersed in offshore waters in mid-February than in previous months, but were still most abundant close to the islands (Fig. III-A4-299). Many sightings were logged near the southern end of Santa Cruz Channel, and birds were again found at considerable distances offshore in the Gulf of Santa Catalina. Incomplete inshore surveys at the same time showed a build-up of total numbers around San Miguel Is. and over 1,100 birds roosting on Anacapa Is. (Table III-A4-169).

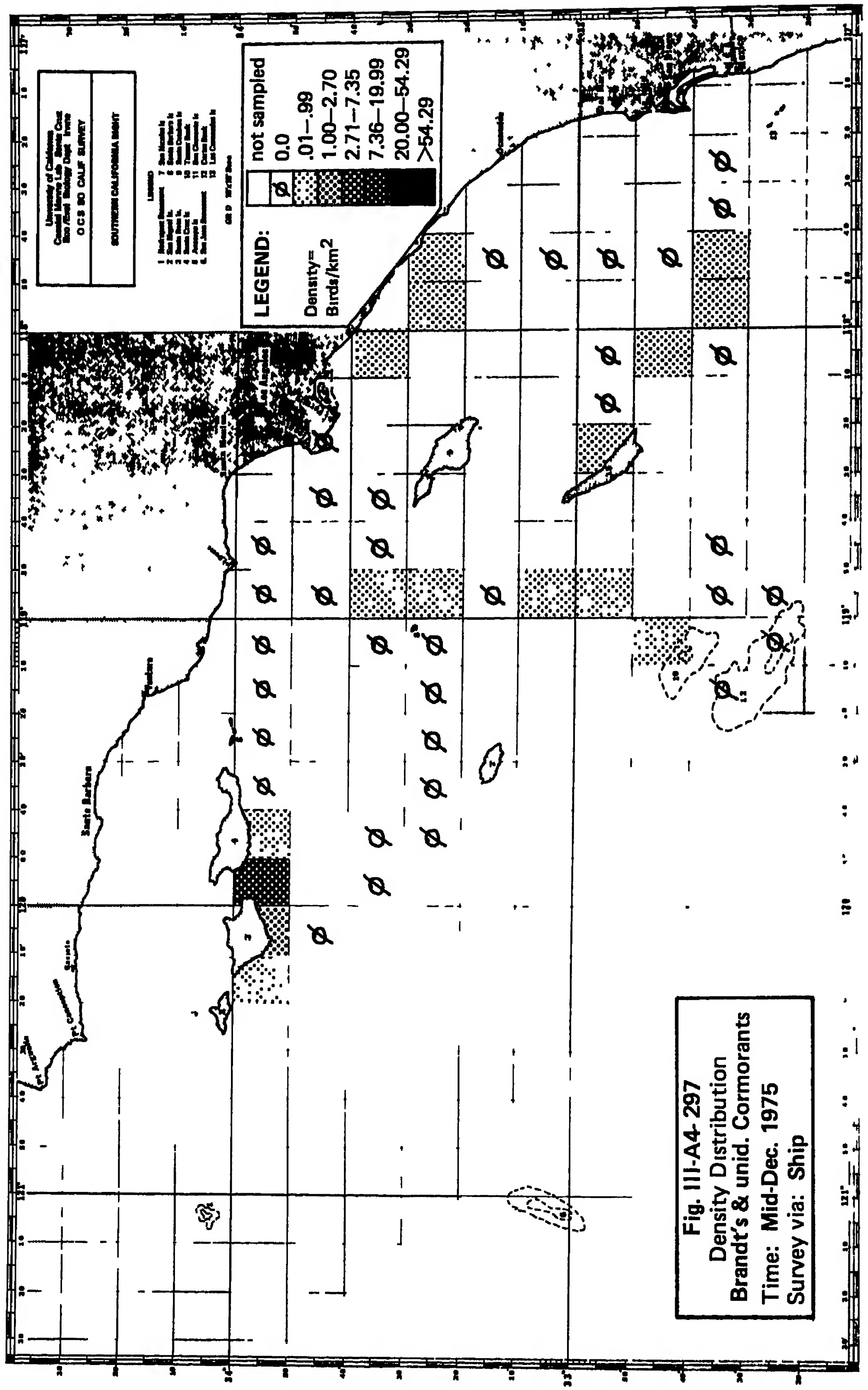


Fig. III-A4-297
Density Distribution
Brandt's & unid. Cormorants
Time: Mid-Dec. 1975
Survey via: Ship

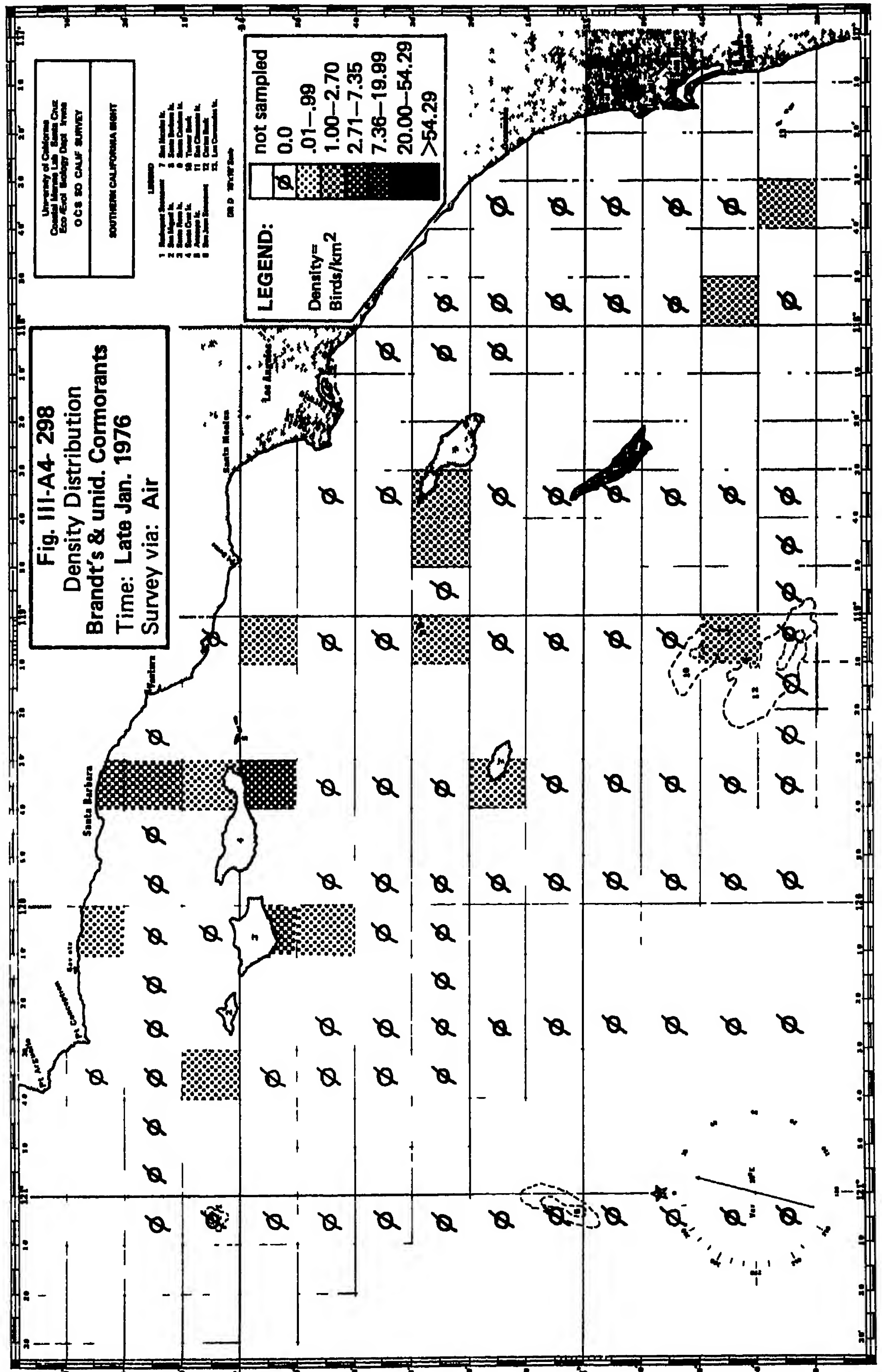


Fig. III-A4- 298
Density Distribution
Brandt's & unid. Cormorants
Time: Late Jan. 1976
Survey via: Air

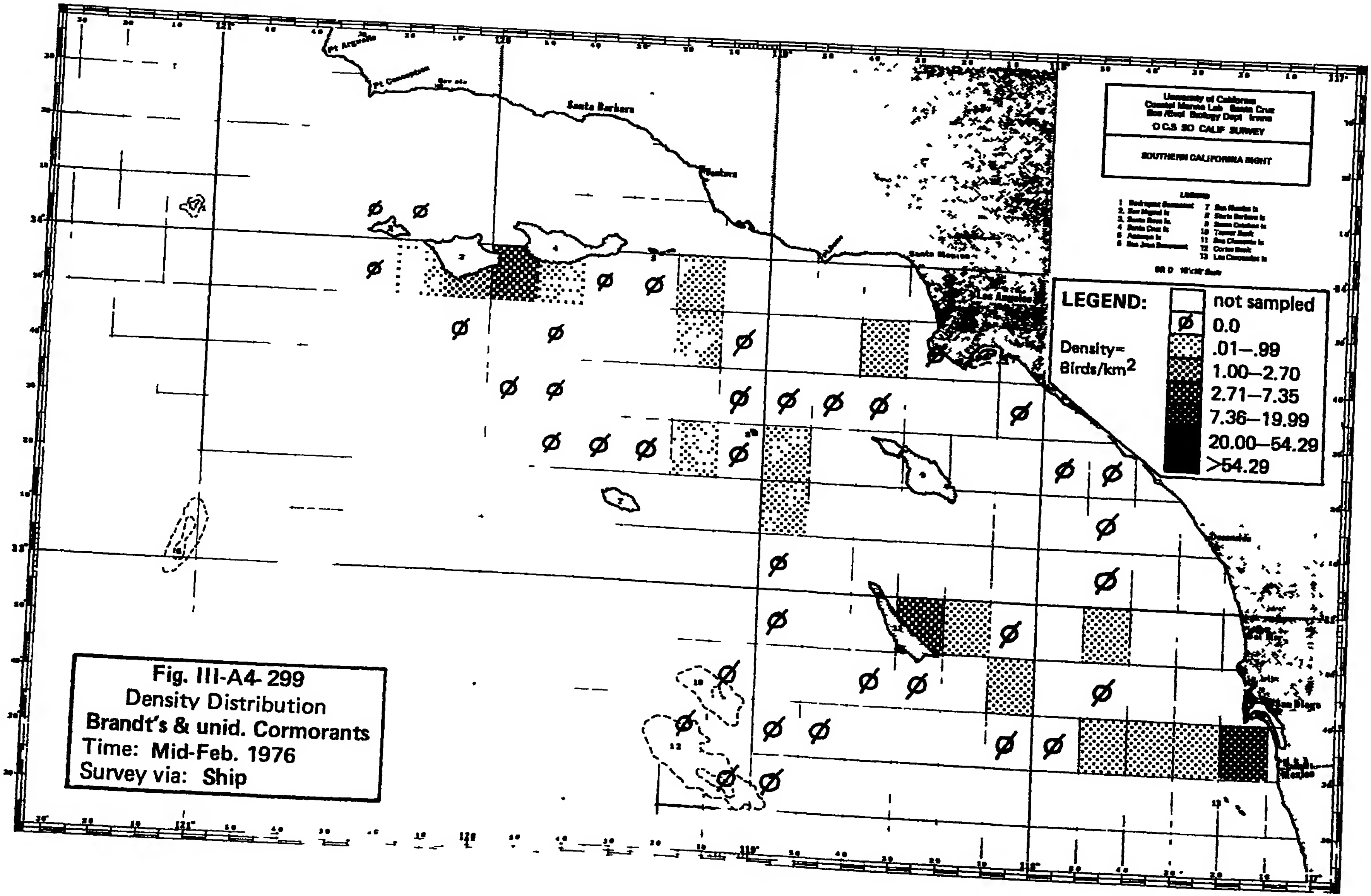


Fig. III-A4-299
Density Distribution
Brandt's & unid. Cormorants
Time: Mid-Feb. 1976
Survey via: Ship

Brandt's Cormorant (continued)

March 1976. Partial aerial surveys of islands (Table III-A4-169) indicated a great decrease in numbers at San Nicolas Is. with perhaps a slight overall increase at San Miguel and Santa Rosa Islands. Birds continued to be found foraging in the immediate vicinity of the islands, with high densities at sea recorded both north and south of Santa Rosa Is., and north of both San Nicolas and San Clemente Islands (Fig. III-A4-300). In contrast to surveys in the preceding several months, none were found east of San Clemente Is.

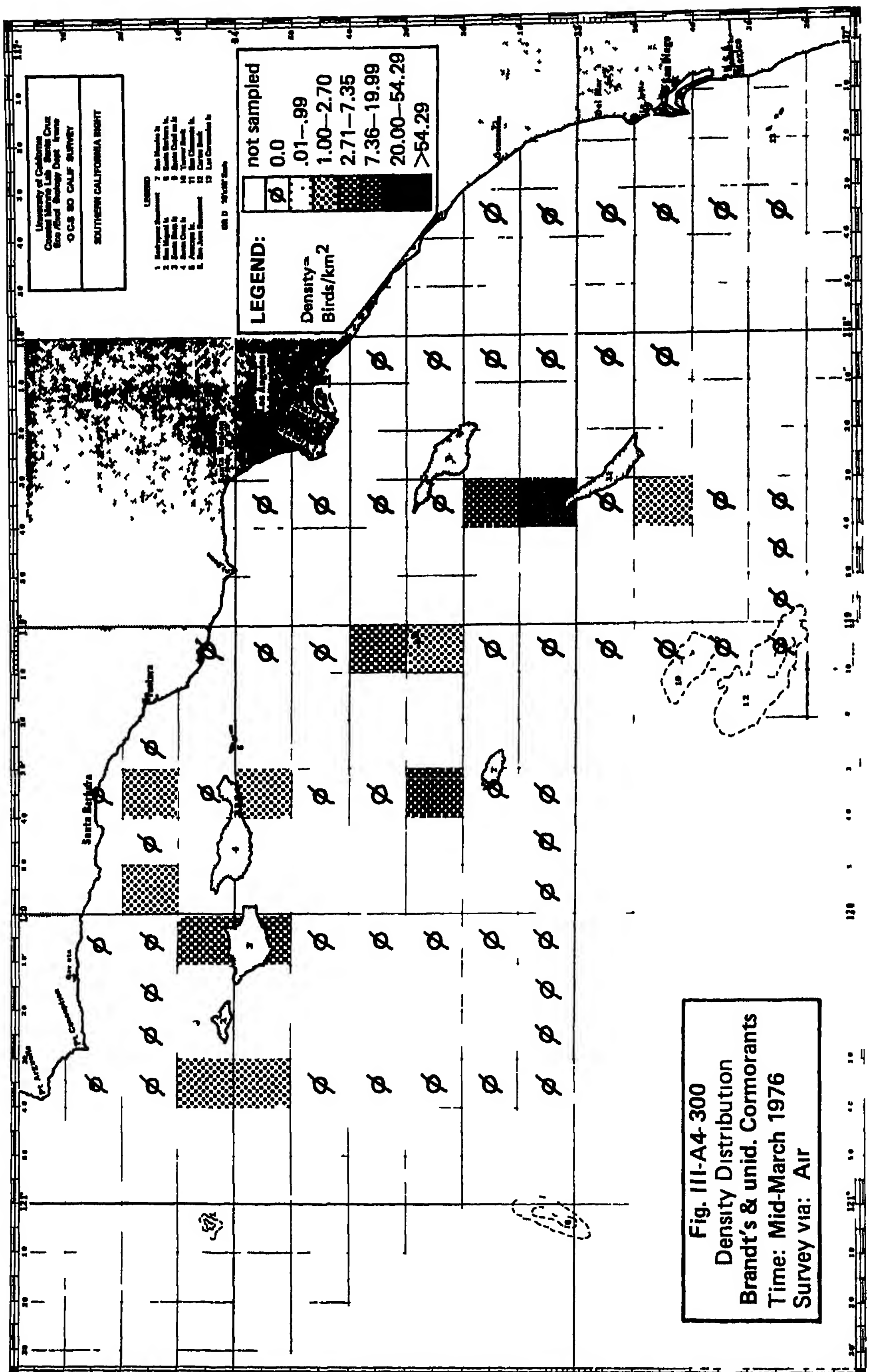


Fig. III-A4-300
Density Distribution
Brandt's & unid. Cormorants
Time: Mid-March 1976
Survey via: Air

Pelagic Cormorant (Phalacrocorax pelagicus)

This is the smallest of the cormorants found in the North Pacific, where it nests from Japan through Alaska to northern Baja California (Palmer 1962). Pelagic Cormorants nest colonially on ledges and small crannies situated on inaccessible cliff faces; their colonies are usually smaller and much more scattered than Brandt's or Double-crested Cormorants. This species has nested on five of the Channel Islands, with most of the breeding colonies located in the northwesternmost islands. They do not nest on Santa Catalina, San Nicolas, or San Clemente Islands.

These birds are strictly marine in distribution in southern California and are most numerous in outer coastal waters and among the Channel Islands (Howell 1917, Willett 1933, Palmer 1962). There is some debate whether their usual habitat is closer inshore or at greater distances from the coast (and in deeper water) than the other cormorants with which it occurs. Howell (1917) and Grinnell and Miller (1944) claim they are found in deep, open waters to a greater extent than Brandt's or Double-crested Cormorants, while Scott (1974) claims the opposite.

Foods taken by this species vary with season and locality; fish species predominate (sculpins and other benthic species count heavily) with crustaceans making up 25% of the diet (Palmer 1962, Scott 1973). They do not forage in large, synchronized flocks as do the other southern California cormorants.

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are summarized on p. III-534.

Pelagic Cormorant (continued)

1975-76 Baseline Data

April 1975. None were recorded at sea from 19 through 21 April, nor on mainland beaches in mid-month.

May 1975. Our only record of this species was of three birds on the south tip of Santa Catalina Is. on the 16th, though several dozen total were known to be nesting at Prince Is. and Bay Pt., San Miguel Is. and on Gull Is., Santa Cruz Is.

June 1975. Six found on the eastern headlands of San Miguel Is. and 36 scattered around Santa Cruz Is. late in the month (Table III-A4-170). One found at Border Field S.B. in mid-June was the only mainland record.

July 1975. None were found at sea or on the mainland. Partial surveys close inshore among the four northern islands yielded sightings of four birds, all on the west and north coast of Santa Rosa Is.

August 1975. None were recorded, though undoubtedly small numbers roosted among the northern islands and Santa Barbara Is.

September 1975. Two were counted at sea 9 km south of Cardwell Pt., San Miguel Is.; two more, 3 km east of South Pt., Santa Rosa Is. Six birds were seen on the three western beaches included in our Santa Cruz Is. beach survey.

October 1975. None recorded.

November 1975. Four were counted at Santa Cruz Is. beaches in early November but none on the mainland. Seven were seen feeding with other seabirds 34 km west of San Clemente Is. on the 19th. Another bird was sighted 22 km west of Pt. Vicente three days earlier.

December 1975. Beach counts recorded single sightings at San Onofre S.B. and Silver Strand S.B., and three birds on Santa Cruz Is. Three were

Table III-A4-170.

Frequency of sightings of Pelagic Cormorants, (total individuals)on and near Channel Island beaches, June 1975 and January-March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Date→	27-30 Jun 75	14-18 Jan 76	11-14 Feb 76	16-22 Mar 76					
Location Type→	Air	Ship	Ship	Ship					
SAN MIGUEL IS.									
Richardson Rk. (103)	0	-	-	-					
West (102,110-20,160,170)	0	13	12	0					
South (146-51)	0	3	48	0					
East (101,140-45)	6	21	118	17					
North (121-40)	0	22	9	0					
SANTA ROSA IS.									
West (611-12,625)	0	14	-	-					
South (620-24)	0	6	42	32					
East (618-19,629)	0	37	-	-					
North (610,613-17)	0	56	-	-					
SANTA CRUZ IS.									
West (641,658)	15	0	-	-					
South (650,653-56)	7	-	7	30					
East (649,651)	0	4	-	-					
North (640,643-48)	14	0	-	-					
ANACAPA IS. (660-80)	0	33	23	9					
SAN NICOLAS IS.									
Northwest (210-60)	0	6	-	-					
Southwest (203)	0	-	-	-					
Southeast (202)	0	-	-	-					
Northeast (201)	0	-	-	-					
SANTA BARBARA IS.(300-330)	0	0	0	29					
SANTA CATALINA IS.									
Northwest (506-07,515, 525-27)	0	-	0	-					
Southwest (503-05,529)	0	-	-	-					
South (502,523-24)	0	-	-	-					
East (501,509-11)	0	-	1	-					
Isthmus (508,521-522)	0	-	0	-					
SAN CLEMENTE IS.									
Northwest (409-11)	0	-	-	-					
West Central (406-08)	0	-	-	-					
Southwest 404-05)	0	-	-	-					
Pyramid Cove (402-03)	0	-	-	-					
East 401,412)	0	-	-	-					

Pelagic Cormorant (continued)

found 3 km east of South Pt., Santa Rosa Is., and one, 18 km northwest of Santa Catalina Is.

January 1976. The only at-sea sighting was one bird 3 km east of San Clemente Is. on the 9th. Aerial and ship counts close inshore among the islands included 59 birds at San Miguel Is., 113 on Santa Rosa Is., 4 on Santa Cruz Island, and six on San Nicolas Is. (Table III-A4-170).

February 1976. A total of 260 Pelagic Cormorants was found during ship surveys close inshore among the four northern islands (Table III-A4-170); most were at the east end of San Miguel Is. This count represents our only complete survey for this species among the northern islands. None were found on mainland beaches or at sea.

March 1976. During inshore surveys from ship and aircraft in mid-March 117 Pelagic Cormorants were counted on the eight Channel Islands (Table III-A4-170). They were found at sea in moderate density on a transect between Bee Rk., Santa Rosa Is., and Prince Is. These were the only offshore sightings. None were recorded on mainland beaches.

Brant (*Branta bernicla*)

Pacific populations of Brant (*B.b. nigricans*, following Johnsgard 1975) are regularly present along the coast of southern California in winter and migration, but scarce in summer. Brant breed along arctic and sub-arctic coasts from western Alaska to central Canada, where interbreeding with the eastern race may occur. Preferred nesting habitats are areas of lowland coastal tundra just above the high tide mark (Johnsgard 1975). Fall migration dates and routes are unclear, but southbound movement in California is strictly coastal. Scott (1974) states that Brant are most abundant in migration, when large flocks may be seen heading toward their Baja California wintering grounds. These geese winter along the coast from British Columbia to Baja California. They prefer shallow marine areas where adequate quantities of eelgrass (*Zostera* sp.) are available. Wintering birds are most often observed in southern California in Morro Bay, Mission Bay, and south San Diego Bay. Numbers have sharply declined in southern California due to loss of habitat, and Scott (1974) says that numbers may still be declining as habitat is further reduced. Scott (1974) states that Brant may be observed in offshore kelp beds, but island records are few. Northbound migration usually occurs in late March and April.

The eastern subspecies of Brant (*B.b. hrota*, American Brant [*B. bernicla*] of A.O.U. 1957) also occurs in southern California. Sams and Stott (1959) and Small (1974) say they are casual but regular visitors to the coast in winter, where they inhabit the same areas as "Black" Brant.

Brant are exclusively vegetarian in diet. Eelgrass (*Zostera marina*) is the primary resource, but sea lettuce (*Ulva* spp.), surfgrass (*Phyllospadix* sp.), and other plants may be used (Johnsgard 1975, Small 1974).

Brant (continued)

1975-76 Baseline Data

April 1975. Several northbound flocks of 50-100 birds were observed along a transect line from San Pedro Harbor to Anacapa Is. in mid-month.

May - August 1975. None recorded.

September 1975. The only record was of a single bird off McGrath S.B. on the 12th.

October 1975. None recorded.

November 1975. A group of eight birds was observed 15-20 km west of San Clemente Is. on the 17th.

December 1975 - January 1976. None recorded.

February 1976. On the mainland coast, five Brant were recorded at P.M.T.C., Pt. Mugu on the 18th. A single bird was observed inshore on the south side of Santa Cruz Is. on the 22nd.

March 1976. Four birds were observed along the mainland coast, at P.M.T.C., Pt. Mugu on the 17th. On 20 March, 24 were seen flying WNW south of Santa Rosa Is. although none were recorded during the regular ship transects that day.

White-winged Scoter (*Melanitta deglandi*)

White-winged Scoters are primarily winter visitors along the California coast, but a few non-breeders may overwinter. The species has the most widespread breeding range of all the scoters, encompassing the interior of western Canada and Alaska. Preferred nesting habitat appears to be islands and islets with sufficient herbaceous vegetation (Johnsgard 1975).

White-winged Scoters winter along the coast from Alaska to Baja California, where they utilize protected nearshore waters (especially the littoral zone just outside the breaker line) of open coast and large bays. Southbound migrants reach the coast of California by October. Formerly they were regarded as common winter visitors (Howell 1917, Willett 1933, Grinnell and Miller 1944), but numbers appear to be declining (Bender et al. 1974). In recent years the birds have been uncommon and irregular in southern California (McCaskie 1968-1975). They are best seen in southern California along the mainland coast or inshore around the northern Channel Islands, particularly San Miguel and Santa Rosa Islands (Jones in prep.). Scott (1974) says they may be seen farther offshore in migration. Northbound birds usually have left the Bight by the end of April.

In the major food study for this species done by Cottam (1939), 75% of the diet was found to be molluscs (63% bivalves). Other sources include crustaceans, and some fishes and plants (Johnsgard 1975).

1975-76 Baseline Data

April 1975. None recorded.

May 1975. The only record was of two birds (with 24 unidentified scoters) observed between Prince Is. and Castle Rk. on the 13th. Three unidentified

White-winged Scoter (continued)

scoters observed 20 km west of Santa Barbara Is. on the 21st may have been this species.

June 1975. None recorded.

July - November 1975. None definitely recorded, though several unidentified scoters were reported in July.

December 1975. White-winged Scoters were recorded along the mainland coast in December, at P.M.T.C., Pt. Mugu (seven with 180 unidentified scoters) on the 8th, and Silver Strand S.B. (one) on the 11th. Two more birds were recorded inshore on the south coast of Santa Cruz Is. on the 7th. The only certain offshore record was of two birds (with one unidentified scoter) about 10 km east of San Clemente Is. in mid-month. Unidentified scoters 5 km southeast of Santa Rosa Is. and 5 km south of Pt. Fermin may have been of this species.

January 1976. Records were restricted to inshore waters of the northern islands in January (Table III-A4-171). Mid-month concentrations were observed on the north side of San Miguel Is., and the north and east sides of Santa Rosa Is. Two unidentified scoters 20 km west of San Diego may have been of this species.

February 1976. Inshore records were again restricted to the northern islands (Table III-A4-171). Mid-month concentrations were observed on the east side of San Miguel Is. and the south side of Santa Rosa Is. On the 22nd, a concentration was noted on the west side of Santa Cruz Is. The only definite offshore record was of three birds 15-20 km west of San Diego.

March 1976. Present inshore around the northern islands again, but in reduced numbers (Table III-A4-171). The only concentration was observed on the south coast of Santa Rosa Is. on the 18th.

Table III-A4-171. Frequency of sightings (total individuals) of White-winged Scoters on and near Channel Islands' beaches, January through March 1976. Numbers in parentheses refer to specific locations on Figs. III-178 through 185.

Date		Location	Number
14-18 January	San Miguel Is.:	north (121-140)	10
	Santa Rosa Is.:	east (618-19, 629)	68
	Santa Rosa Is.:	north (610, 613-17)	25
	Santa Cruz Is.:	south (650, 653-56)	1
11-14 February	San Miguel Is.:	west (102, 110-20, 160-70)	2
	San Miguel Is.:	south (146-51)	1
	San Miguel Is.:	east (101, 140-45)	15
	Santa Rosa Is.:	south (620-24)	32
	Santa Cruz Is.:	south (650, 653-56)	4
18 March	San Miguel Is.:	east (101, 140-45)	4
	San Miguel Is.:	north (121-40)	4
	Santa Rosa Is.:	south (620-24)	30
	Santa Rosa Is.:	east (618-19, 629)	8

Surf Scoter (Melanitta perspicillata)

Surf Scoters are by far the most abundant scoter along the California coast in most winters. They are primarily seen in migration and in winter, but a few non-breeders oversummer.

Most of these scoters breed in north and central interior Canada, but local colonies exist in Alaska. Nesting habitat is poorly known but probably includes freshwater ponds and lakes with adequate herbaceous cover (Johnsgard 1975).

Surf Scoters winter along the coast from Alaska to central Baja California. They prefer the littoral waters of open coasts and large bays, but a few may show up in estuaries and lagoons. Many southbound birds reach the southern California coast by October. These birds have been described as widespread and common in southern California throughout the historical record. They are best seen along the mainland coast and inshore among the Channel Islands. Howell (1917) says that they prefer beaches, possibly explaining their greater abundance along the mainland coast. Scott (1974) states up to 30,000 birds may be seen on San Diego Bay in the winter.

Cottam (1939) reported the Surf Scoter diet to be 60% molluscs, 10% insects, 10% crustaceans, and 12% plants. Of the molluscs, a large proportion were found to be mussels. They prefer to forage at the edge of the breaker line, where they dive for prey (Johnsgard 1975).

1975-76 Baseline Data

April 1975. The only record for the mainland coast was of 21 birds at Pt. Mugu S.B. on the 13th. Inshore records included two birds each on the north and west sides of Santa Cruz Is. and six birds at Santa Barbara

Surf Scoter (continued)

Is. No offshore surveys were made in April.

May 1975. Surf Scoters were recorded at two mainland beaches: 100 birds at Dockweiler S.B. on the 11th, and six birds at South Carlsbad S.B. on the 16th. They were also recorded inshore on the south coast of Santa Cruz Is. (Table III-A4-172). A group of three unidentified scoters observed 20 km west of Santa Barbara Is. on the 21st may have been of this species.

June 1975. The only record for the mainland coast was two birds at Pt. Mugu S.B. on the 16th. Mid-month island inshore records include two birds north of San Miguel Is., four birds south of Santa Cruz Is., and one bird southwest of San Nicolas Is. None were recorded offshore.

July 1975. The only Surf Scoter recorded was a single female bird at P.M.T.C., Pt. Mugu, on the 15th. Four unidentified scoters on the west coast of Santa Cruz Is. on the 13th and five at Pt. Mugu S.B. on the 15th may have been of this species.

August 1975. The only record was two birds at P.M.T.C., Pt. Mugu, on the 4th.

September - October 1975. None recorded.

November 1975. Recorded at three mainland beaches in November (Table III-A4-172), the maximum was 43 birds at Silver Strand S.B. on the 13th. In mid-month, these birds were present on the south side on the northern islands (except San Miguel Is.), but none were recorded inshore; all sightings were of birds 4-8 km from land. The major concentration was south of Santa Cruz Is. (Fig. III-A4-301). Other offshore records included birds 5-40 km north of Santa Barbara Is., and 10-15 km north of North

Table III-A4-172.Frequency of sightings of Surf Scoter (total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	2	2	0	0	-	21	-	-	0	-	0	0	25
11-24 May	0	0	8	0	-		100	0	0	6	0	0	114
13-19 June	0	0	0	0	-	2	0	0	0	0	0	0	2
11-18 July	0	0	0	0	1	0	0	0	0	0	0	0	1
1-7 August	0	0	0	0	2	0	0	0	0	0	0	0	2
11-18 September		None recorded									-	-	0
15-18 October		None recorded									-	-	0
6-14 November	0	0	0	0	10	1	0	0	0	0	43	0	54
4-11 December	13	0	18	0	26	1	100	3	2	28	33	25	249
11-18 January, 1976	20	7	30	0	181	1	162	0	0	27	507	0	935
16-24 February	39	12	24	0	45	0	149	0	3	0	2	0	274
11-22 March	13	12	24	0	57	0	129	0	0	0	19	5	259

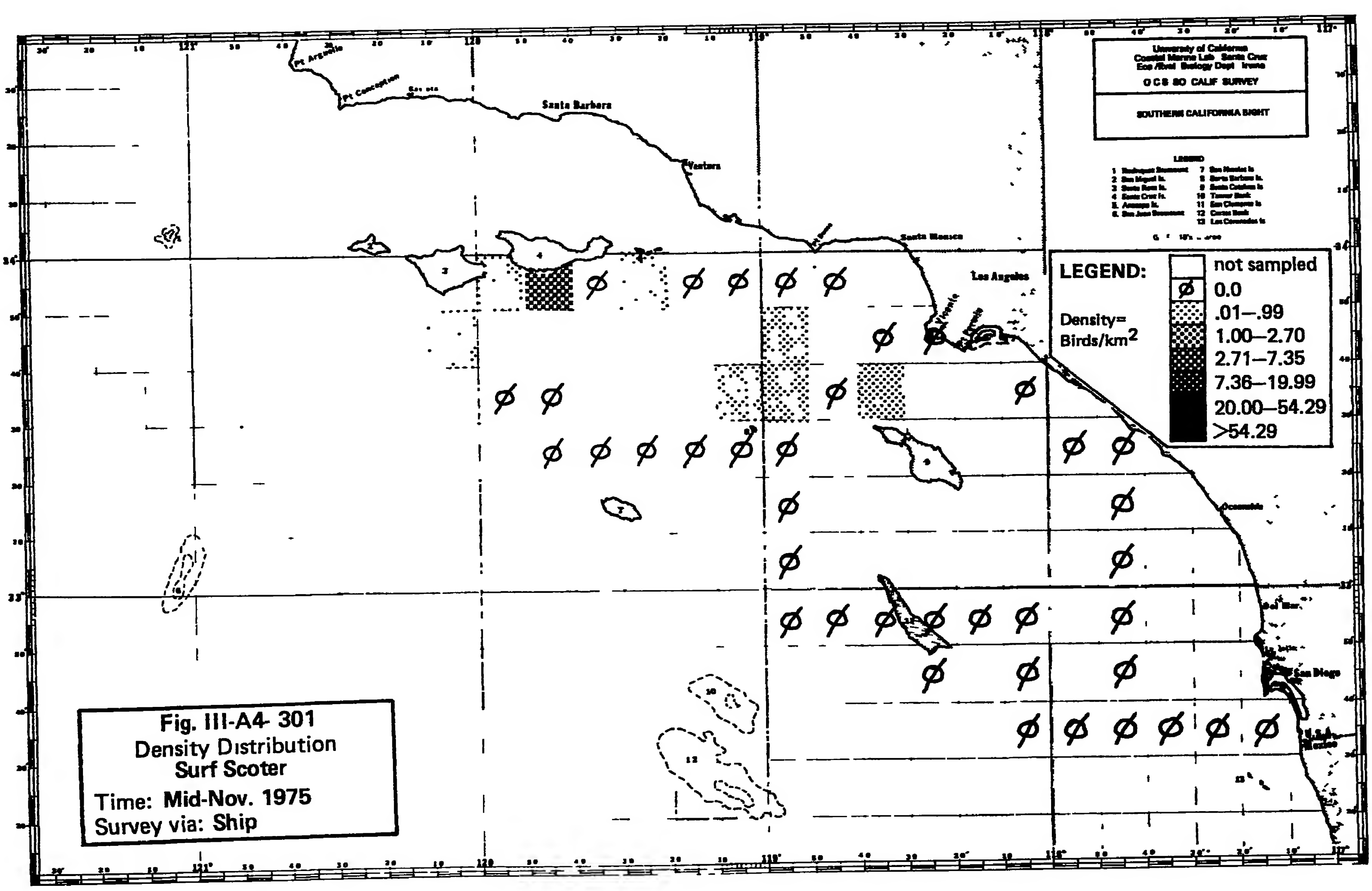


Fig. III-A4- 301
Density Distribution
Surf Scoter
Time: Mid-Nov. 1975
Survey via: Ship

Surf Scoter (continued)

Head, San Clemente Is.

December 1975. Recorded at eight mainland beaches in early December (Table III-A4-172); maximum was 100 birds at Dockweiler S.B. on the 4th. The birds were observed inshore around Santa Cruz and Santa Rosa Islands (Tables III-A4-172-173) with one group of 11 observed 1-5 km off the southeast coast of Santa Rosa Is. Unidentified scoters 5 km southeast of Santa Rosa Is. and 5-10 km south of Pt. Fermin may have been of this species.

January 1976. A total of 878 birds were recorded from five mainland beaches in mid-January; maximum was 507 birds at Silver Strand S.B. on the 12th (Table III-A4-172). Concentrations were noted inshore around the northern islands in mid-month, and two birds were seen inshore at Santa Barbara Is. (Table III-A4-173). The only definite offshore records were of five birds 10-15 km west of Pt. Vicente, but two unidentified scoters 10-15 km west of San Diego may have been of this species.

February 1976. Counts were down to 199 birds at four mainland beaches; maximum was 149 birds at Dockweiler S.B. on the 18th. Counts increased inshore around the northern islands, with heaviest concentrations occurring on the southern coasts (Table III-A4-172). A few scoters appeared inshore at Santa Catalina Is. (Table III-A4-173). The only offshore record was two birds 10-20 km south of Long Beach in mid-month.

March 1976. A total of 210 birds were recorded at four mainland beaches (Table III-A4-172); maximum was 129 birds at Dockweiler S.B. on the 16th. They were heavily concentrated inshore on the south and east sides of Santa Rosa Is., with scattered sightings elsewhere inshore around the northern islands (Table III-A4-173). The only offshore records were

Table III-A4-173.

Frequency of sightings of Surf Scoters
(total individuals)on and near Channel Island beaches, Dec. 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Location / Date→ / Type→	16-18 Dec 75 Air	14 18 Jan 76 Ship	11-14 Feb 76 Ship	12-14 Mar 76 Air	18-21 Mar 76 Ship
SAN MIGUEL IS.					
Richardson Rk. (103)	-	-	-	0	0
West (102,110-20,160,170)	-	17	20	0	0
South (146-51)	-	116	52	6	0
East (101,140-45)	-	0	33	8	1
North (121-40)	-	0	38	6	1
SANTA ROSA IS.					
West (611-12,625)	4	42	-	9	-
South (620-24)	7	4	294	389	610
East (618-19,629)	7	363	-	229	854
North (610,613-17)	0	115	-	0	-
SANTA CRUZ IS.					
West (641,658)	-	-	-	0	-
South (650,653-56)	-	154	567	0	126
East (649,651)	-	14	-	0	-
North (640,643-48)	-	-	-	401	-
ANACAPA IS. (660-80)	-	8	110	-	5
SAN NICOLAS IS.					
Northwest (210-60)	-	-	-	0	-
Southwest (203)	-	-	-	0	-
Southeast (202)	-	-	-	0	-
Northeast (201)	-	-	-	0	-
SANTA BARBARA IS.(300-330)	0	2	0	1	6
SANTA CATALINA IS.					
Northwest (506-07,515, 525-27)	0	-	0	0	-
Southwest (503-05,529)	0	-	-	0	-
South (502,523-24)	0	-	-	0	-
East (501,509-11)	0	-	8	0	-
Isthmus (508,521-522)	0	-	0	0	-
SAN CLEMENTE IS.					
Northwest (409-11)	0	-	-	0	-
West Central (406-08)	0	-	-	0	-
Southwest 404-05)	0	-	-	0	-
Pyramid Cove (402-03)	0	-	-	-	-
East 401,412)	0	-	-	-	-

Surf Scoter (continued)

of a single bird north of San Pedro Pt., Santa Cruz Is. (within 8 km of shore), and a flock of 10 birds in mid-Santa Barbara Channel.

Red-breasted Merganser (_Mergus serrator_)

The Red-breasted Merganser is the only saltwater merganser along the California coast. They are best observed in winter and migration, but a few birds may be present year-round.

The breeding range encompasses all of Alaska and north-central and eastern Canada. Preferred nesting habitat seems to be deep, freshwater leaks (rock-lined not tundra) and streams, but a variety of habitats may be employed (Johnsgard 1975).

Red-breasted Mergansers winter along the coast from Alaska to Baja California. They may use a variety of habitats, from open coast to large bays to brackish estuaries, but shallow, protected waters are preferred. Winter birds arrive along the California coast in October. They are described as fairly common in southern California throughout the historical record. They are best looked for along the mainland coast and inshore around the islands.

These mergansers forage in shallow water, often in small groups, where they dive for prey. Small fishes make up about 75% of the diet, supplemented by crustaceans and other invertebrates (Johnsgard 1975).

1975-76 Baseline Data

April 1975. Eight birds, four males and four females, were counted at San Onofre S.B. on the 14th.

May 1975. None recorded.

June - August 1975. A single female bird at Border Field S.B. on 19 June.

September 1975. Four females were recorded at P.M.T.C., Pt. Mugu, on the 18th, and 12 there in the west lagoon on the 19th.

Red-breasted Merganser (continued)

October 1975. Four birds were still present at P.M.T.C., Pt. Mugu, on the 16th.

November 1975. Sixteen birds (3 males, 13 females) were at P.M.T.C., Pt. Mugu, on the 10th and 11th.

December 1975. Red-breasted Mergansers showed up at four mainland beaches in early December (Table III-A4-174). Thirteen were at Border Field S.B. on the 11th. A single male was observed inshore at China Harbor, Santa Cruz Is. on the 6th.

January 1976. Recorded at three mainland beaches in mid-month (Table III-A4-174).).

February 1976. The only mainland record was of 14 birds at P.M.T.C., Pt. Mugu, on the 18th and 19th. They were recorded inshore at each of the four northern islands in mid-month (Table III-A4-175).

March 1976. Recorded at three mainland beaches (Table III-A4-174). was 11 birds (one male, ten females) on the 17th. Single birds were observed inshore south of Santa Cruz Is., south of Santa Rosa Is. and southeast of San Nicolas Is. (Table III-A4-175).

(total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	0	-	0	-	-	8	-	0	0	8
11-24 May		None	recorded										
13-19 June	0	0	0	0	-	0	0	0	0	0	0	1	1
11-18 July		None	recorded										
1-7 August		None	recorded										
11-18 September	0	0	0	0	16	0	0	0	0	0	-	-	16
15-18 October	0	0	0	0	4	0	0	0	0	0	-	-	4
6-14 November	0	0	0	0	16	0	0	0	0	0	1	7	24
4-11 December	1	0	0	0	4	0	0	0	8	4	0	13	30
11-18 January, 1976	0	0	1	0	5	0	0	0	3	5	0	0	14
16-24 February	3	0	0	0	14	0	0	0	0	0	0	0	17
11-22 March	0	1	1	1	11	0	0	0	1	0	0	0	15

Table III-A4-175. Distribution of sightings of Red-breasted Mergansers on Channel Islands beaches, January - March 1976. Numbers refer to specific locations on Figs. III-178 through III-185.

Date	Location	Number
16 January	Santa Rosa Is. east (618-19, 629)	1
22-25 January	San Nicolas Is. southwest (203)	1
11-14 February	San Miguel Is. north (121-40)	2
	Santa Rosa Is. south (620-24)	8
	Santa Cruz Is. south (650, 653-56)	3
	Anacapa Is.	1
11-19 March	Santa Rosa Is. south (620-24)	1
	Santa Cruz Is. south (650,653-56)	1
	San Nicholas Is. southeast (202)	1

Red Phalarope (<u>Phalaropus fulicarius</u>)

The Red Phalarope nests in tundra throughout arctic and boreal North America. It is a common spring and fall migrant in the Southern California Bight and scarce by early summer. Northward migration begins in March, peaks in May, and by June most birds have left the southern California area. Miller (1936) reported them as "abundant" off San Diego between 23 July and 1 August 1935, though normally they are scarce in this region in July. Southward migration appears to begin in late August and may last through November. Pyle and DeLong (1968 ms) suggested that Red Phalaropes forage more in fall migrations, and therefore travel more slowly than in spring, in the area offshore of Pt. Conception. Abundance in fall appears to vary between years; in some, they are seen all along the southern California coast, while in other years they are rare (McCaskie 1968a, 1970a, 1971a, 1973a, 1974a). In some years many birds winter in southern California.

Miller (1936) reported a major die-off of Red Phalaropes in southern California in fall 1934, as did Bond (1971) for fall 1969 and winter 1970. Bond related mortality to failure of the species' normal planktonic food supply. Red Phalaropes are also known to feed on insects, both on the nesting grounds and in California (Bent 1921).

1975-76 Baseline Data

Note: in 1975-76 Red Phalaropes were found to be much more abundant offshore than were Northern Phalaropes. Accordingly, except where species composition was definitely noted otherwise, all phalarope sightings offshore were referred to Red Phalaropes, and unidentified sightings near shore were referred to Northern Phalaropes. Density maps, Figs.III-A4-303 thru -306 represent combined density values for identified and unidentified birds.

Red Phalarope (continued)

April 1975. None recorded.

May 1975. One sighting of two birds about 15 km south of San Miguel Passage was our only record of this species (sampling was not representative of the offshore waters in the study area). None were seen on mainland or Santa Cruz Is. beaches.

June 1975. None recorded.

July 1975. None recorded. Flocks of unidentified phalaropes were encountered between 22 and 26 July south of Santa Cruz Is., between San Nicolas and Santa Barbara Islands, and offshore of San Diego about 40 km. These birds were, however, best referred to the Northern Phalarope with which they were intermixed.

August 1975. Not recorded, though unidentified phalaropes (again, probably Northern) were seen from ship in moderate to large numbers on 24, 25 and 30 August throughout Santa Monica Bay, south of Santa Cruz Is. and San Pedro Channel.

September 1975. A flock of nine Red Phalaropes was recorded approximately 15 km south of San Miguel Passage on 9 September, 17 were seen just off South Pt., Santa Rosa Is. on 10 September, and one at Cortes Bank on 11 September. Unidentified phalaropes were found in small flocks in Santa Monica Bay and 30 km northeast of Cortés Bank between 22 and 26 September.

October 1975. Only one sighting was recorded. Two birds were seen approximately 55 km northeast of Cortes Bank. Unidentified phalaropes, probably Reds, were seen at the same location, in the center of Santa Cruz Basin, and 15 km west of Cortés Bank. All sightings were between 27 and 30 October.

Red Phalarope (continued)

November - December 1975. None recorded.

January 1976. Small numbers of unidentified phalaropes were seen on the 6th at scattered locations in Santa Barbara Channel, near San Miguel Is., and 95 km south of there. On the 8th, a flock of ten Red Phalaropes was recorded 15 km north of Cortés Bank and large numbers of unidentified and Northern Phalaropes were recorded between there and Cortés Bank. Between the 25th and 28th, Red Phalaropes were recorded off San Diego, in the vicinity of Tanner-Cortés Banks, Santa Cruz Basin, and Santa Barbara Ch. (Fig. III-A4-303). Numerous unidentified phalaropes were recorded from the same locations, over portions of the Santa Rosa-Cortés Ridge, and far at sea along 121°W.

February 1976. We saw one Red Phalarope 20 km northeast of San Nicolas Is. and nine near Castle Rk., San Miguel Is. on the 11th; one 30 km northwest of Santa Barbara Is. on the 12th, and one at East Anacapa Is. on the 13th. They were not recorded at sea away from the vicinity of the northern islands.

March 1976. Red Phalaropes were found in moderate numbers in the vicinity of Anacapa Passage, between there and Santa Barbara Is., and north of Santa Catalina Is. Unidentified phalaropes, probably of this species, were irregularly common offshore of the Santa Rosa-Cortes Ridge (Fig. III-A4-304).

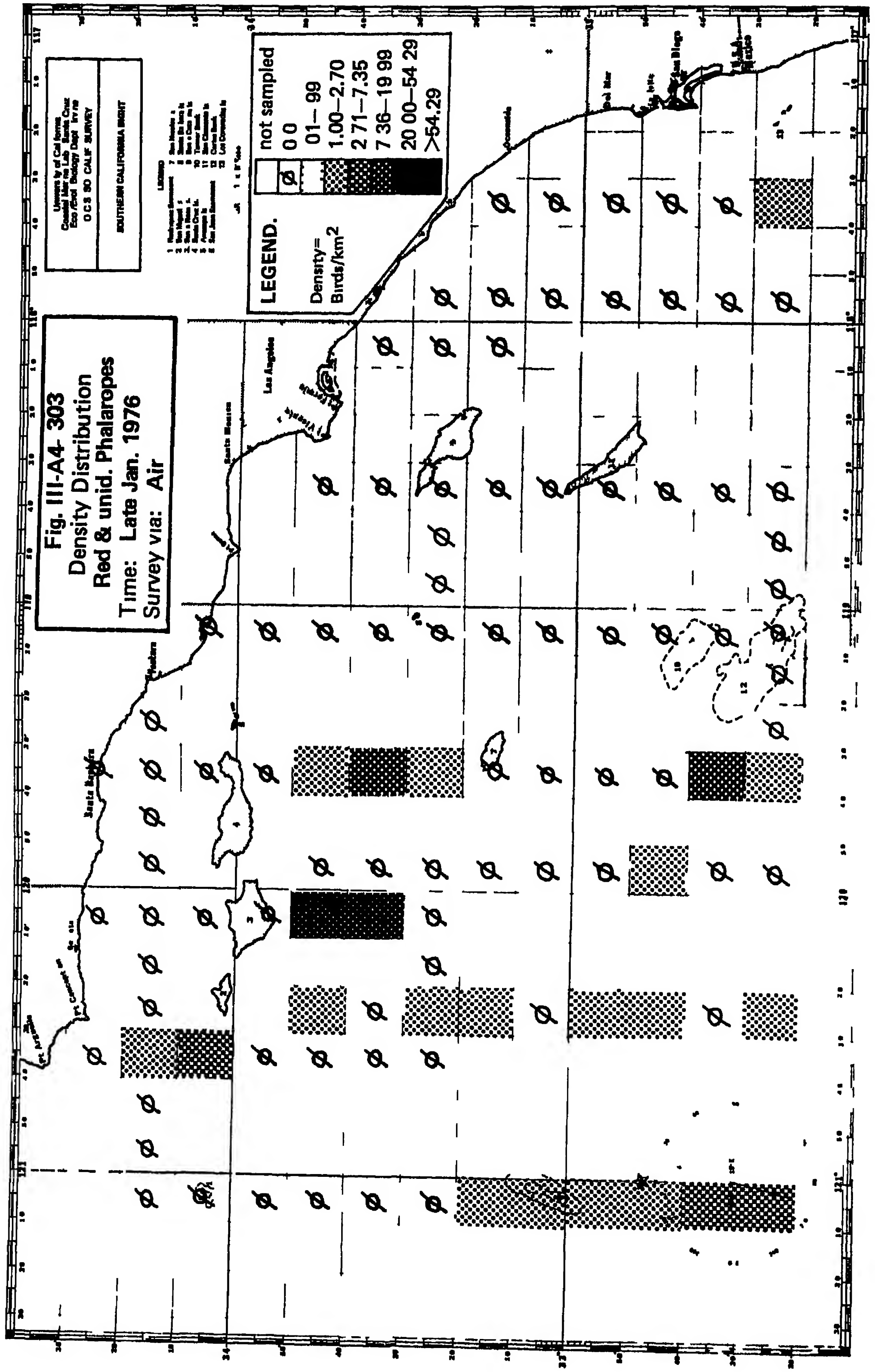


Fig. III-A4- 303
Density Distribution
Red & unid. Phalaropes
Time: Late Jan. 1976
Survey via: Air

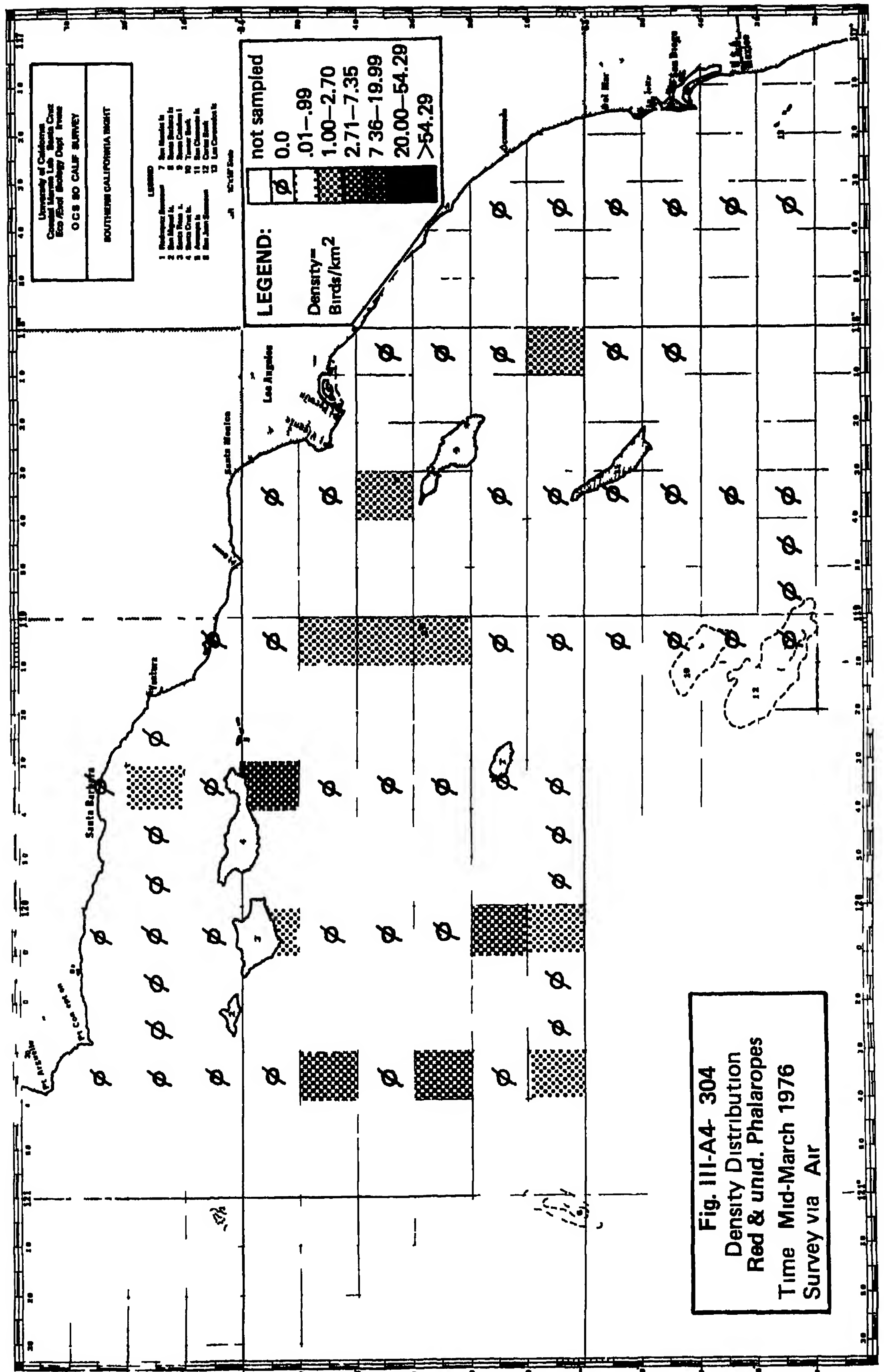


Fig. III-A4- 304
Density Distribution
Red & unid. Phalaropes
Time Mid-March 1976
Survey via Air

Northern Phalarope (Lobipes lobatus)

Northern Phalaropes are circumpolar breeders, perhaps nesting farther to the south than the Red Phalarope. Both species feed on insects, crustaceans, and other elements of both fresh and salt water plankton (Bent 1927).

The Northern Phalarope is a spring and fall migrant in the study area, varying in abundance from year to year. Most birds pass through the area in April to May and July to October. Many migrate offshore (5-25 km or more off the mainland), and they often use the passages between the islands (Howell 1917, Scott 1974). Pyle and DeLong (1968 ms) reported them as rare in the P.O.B.S.P. Eastern Grid in 1967-68. About 50 Northern Phalaropes have wintered in south San Diego Bay since the mid-1960's (McCaskie 1975b), but winter records from offshore localities north of Mexico are nearly lacking.

1975-76 Baseline Data

Note: see account of Red Phalarope regarding sightings of unidentified phalaropes.

April 1975. Not recorded. Twenty unidentified phalaropes, probably of this species, were recorded on 21 April approximately 20 km northwest of Santa Catalina Is.

May 1975. Northern Phalaropes were seen in scattered locations northeast and east of Santa Barbara Is. and west of Oceanside on 7, 9, and 10 May (Fig. III-A4-305). All sightings were of apparently migrating groups of 3 to 23 individuals. The species was not seen in the vicinity of San Miguel Is. 13-15 May; no phalaropes were recorded east of or in the vicinity of Santa Catalina and San Clemente Islands 16 May, nor in Santa

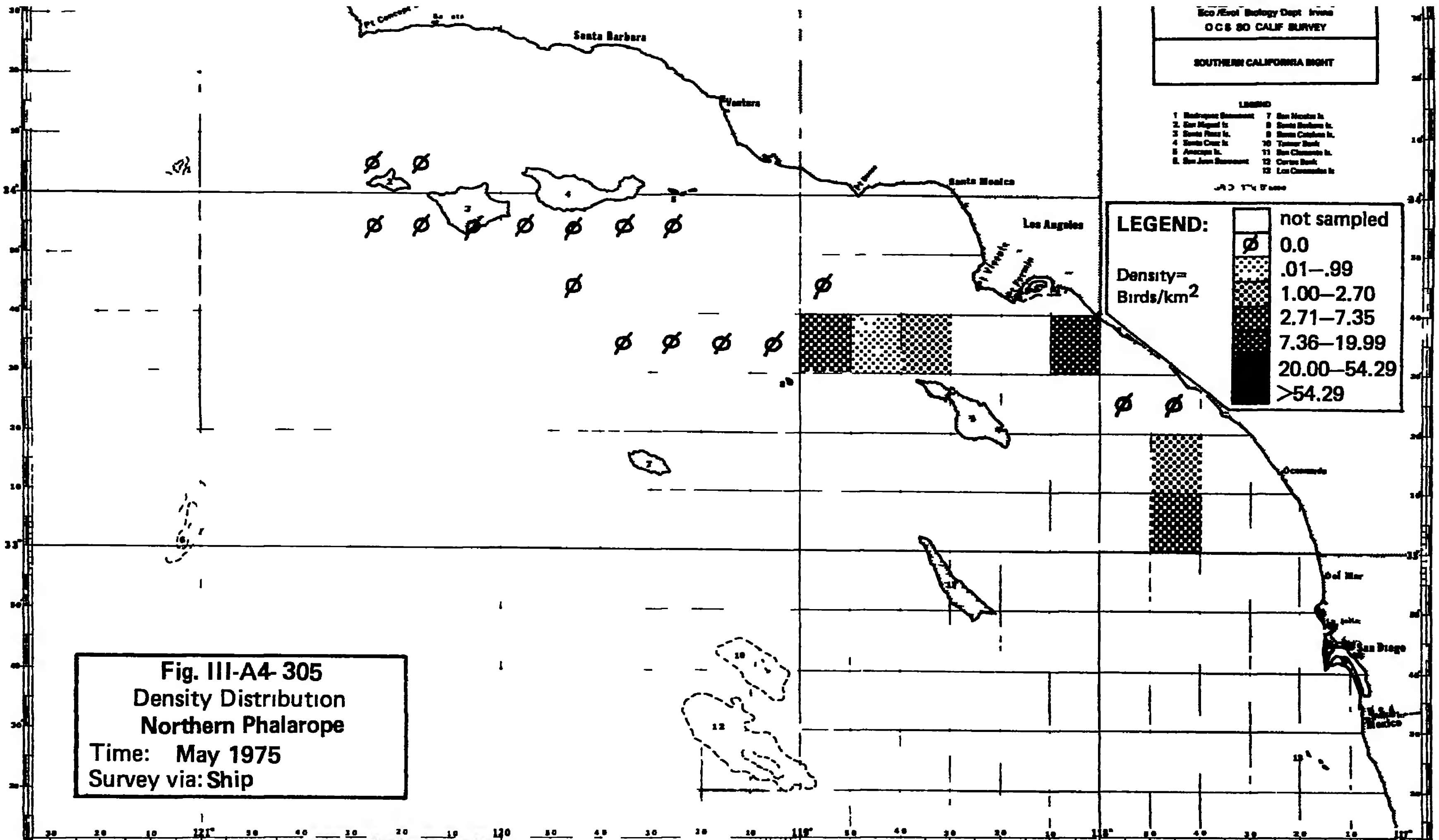


Fig. III-A4-305
Density Distribution
Northern Phalarope
Time: May 1975
Survey via: Ship

Northern Phalarope (*Lobipes lobatus*)

Cruz Basin on 27 May. The northward migration of Northern Phalaropes in the study area was apparently over by mid-month.

June 1975. None recorded.

July 1975. On 16 July, two sightings of Northern Phalaropes were recorded 26 km northwest of San Nicolas Is. Five sightings of small flocks in Catalina Basin on the 18th, and moderately large numbers in scattered locations inshore of the Santa Rosa-Cortés Ridge between 21 and 26 July, marked the beginnings of southward migration. Moderate numbers of unidentified phalaropes, probably of this species, were also recorded late in the month (Fig. III-A4-306).

August 1975. Northern Phalaropes were recorded at four locations close to the south side of Anacapa Is. and northeast of Santa Barbara Is. on 25 August. Unidentified phalaropes were recorded from a variety of locations near Santa Cruz, San Clemente, and Santa Barbara Islands, Pt. Vicente, Los Angeles Co., and Huntington Beach, Orange Co. A flock of 100 unidentified phalaropes, probably Northerns, was sighted from shore at McGrath S.B. on 31 August.

September 1975. We recorded 16 sightings of this species from the 9th to the 13th, and two more sightings on the 25th. All sightings were of small flocks and most were flying south. Unidentified phalaropes found in small numbers near Pt. Vicente were probably of this species.

October 1975 - March 1976. None definitely recorded.

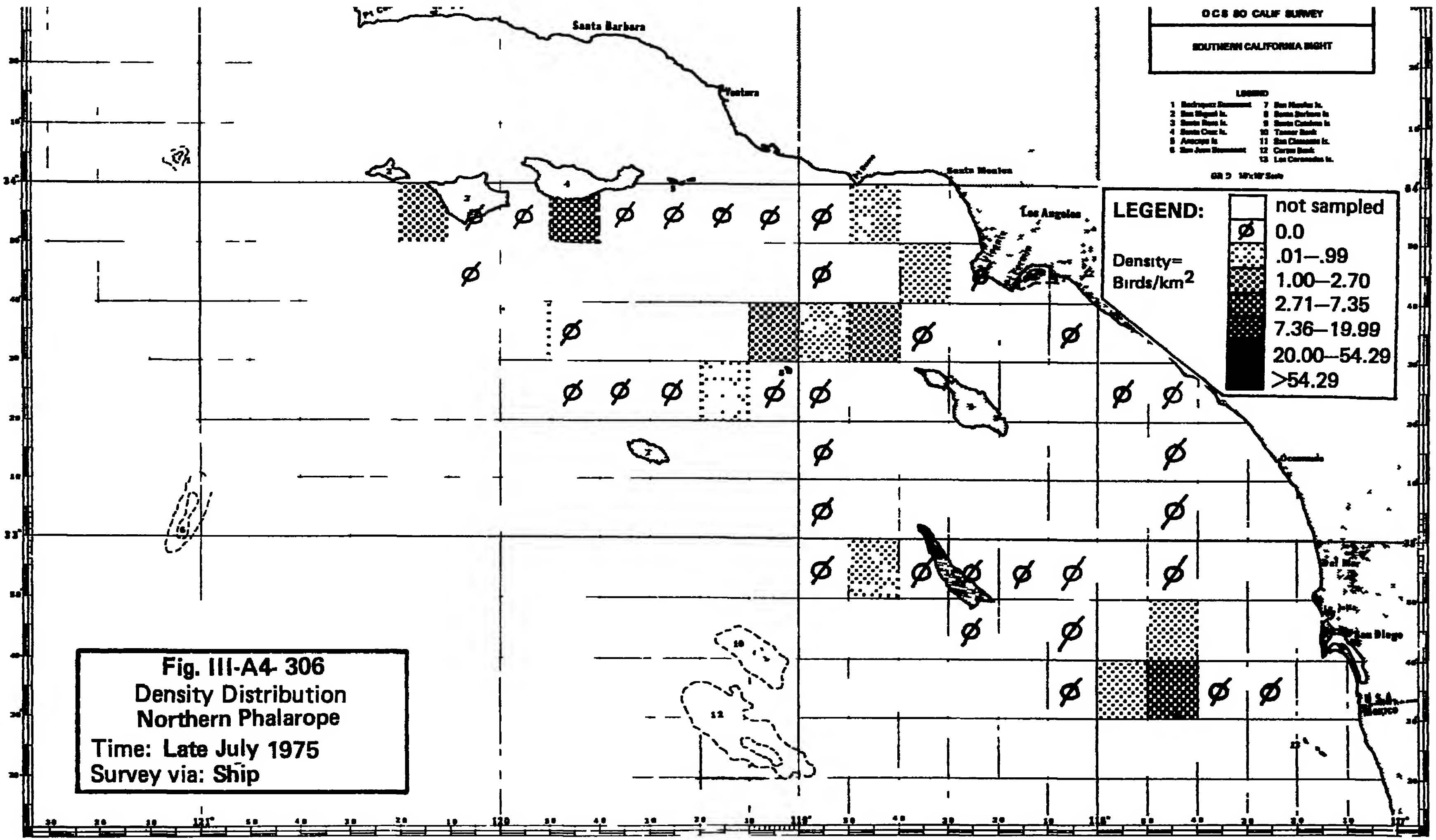


Fig. III-A4- 306
Density Distribution
Northern Phalarope
Time: Late July 1975
Survey via: Ship

ɔuth Polar Skua (Catharacta maccormicki)

Skuas, probably of this species, have shown up in southern alifornia waters each fall in recent years. As Jehl (1973b) pointed out, here are very few local ornithologists who are competent to distinguish etween certain plumages of the South Polar Skua and those of the eddish C. skua chilensis of South America. Devillers (cited in Jehl 1973), as reviewed the available records of skuas from California and has ɔncluded C. maccormicki is the species usually seen off this coast. yle and DeLong (1968 ms) reported skuas as uncommon in the P.O.B.S.P. astern Grid. Southern California records are predominantly fall ightings.

Nothing is known about the food habits of skuas off the southern alifornia coast, though several observers have seen them harass other eabirds in the manner of jaegers.

1975-76 Baseline Data

pril - May 1975. None recorded.

une 1975. A single immature bird was seen from the air near the oronados Escarpment on the 30th (Fig. III-A4-307).

uly 1975. Two birds were seen late in the month on the eastern flank f the northern Santa Rosa-Cortés Ridge, 18 km northeast of San Nicolas s.

ugust 1975. One bird was seen 20 km south of Santa Rosa Is. on the 26th.

eptember 1975. We recorded a total of 12 birds on two cruises this month Fig. III-A4-307). The majority was found between San Miguel and San icolas Islands in waters overlying the Santa Rosa-Cortés Ridge. Two ere found near Tanner-Cortés Banks.

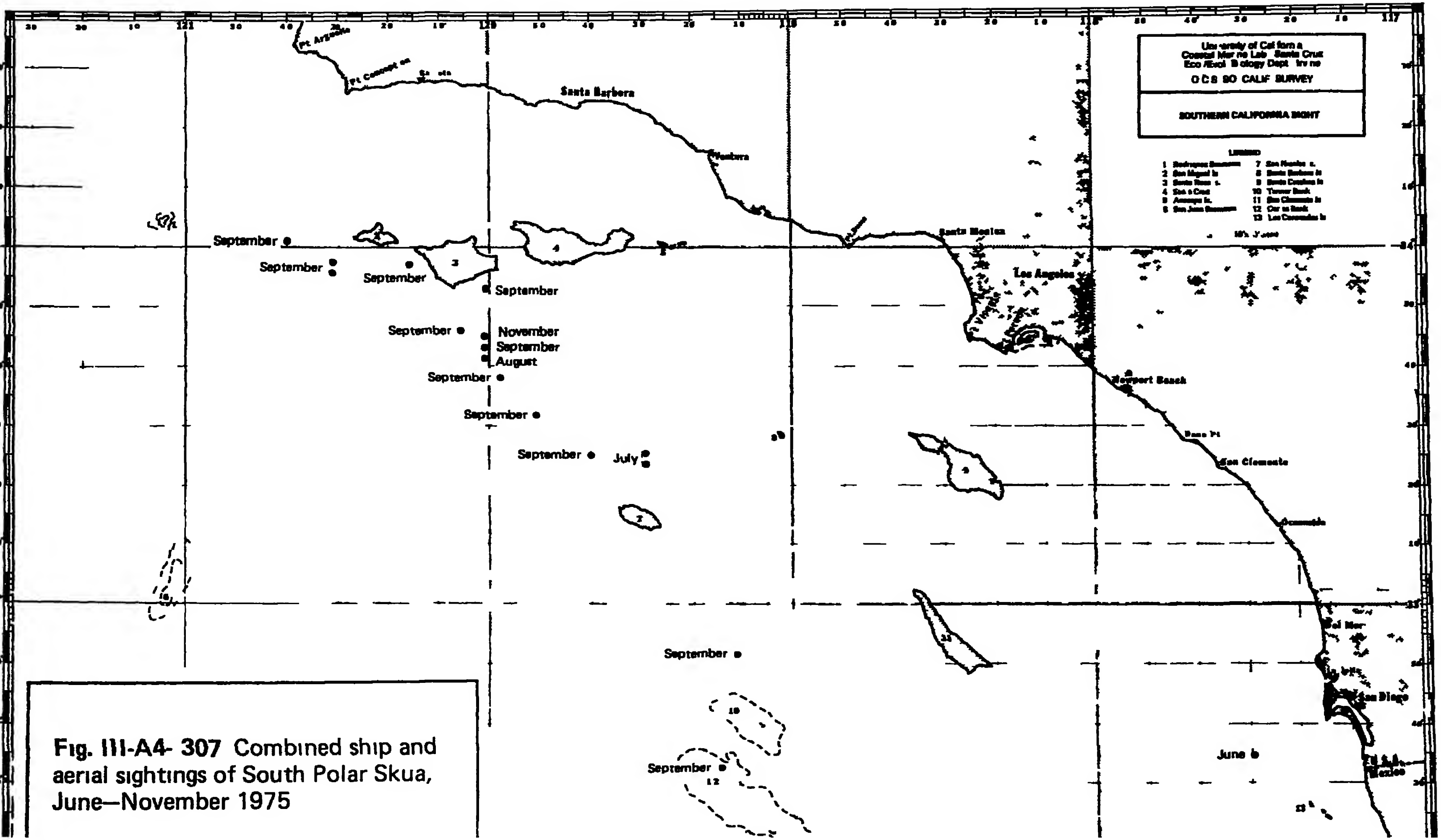


Fig. III-A4- 307 Combined ship and aerial sightings of South Polar Skua, June—November 1975

South Polar Skua (continued)

October 1975. None recorded.

November 1975. One bird was seen 20 km south of Santa Rosa Is. on the 18th. This sighting occurred within 3 km of the location where single skuas had been seen two and three months previously.

December 1975 - March 1976. None recorded.

Pomarine Jaeger (*Stercorarius pomarinus*)

This is the jaeger most commonly encountered away from the southern California mainland shore (the Parasitic Jaeger, *S. parasiticus*, predominates along the shore). Though present all year, most records are from the fall and early winter months, with peak numbers usually occurring between mid-October and the end of December (Scott 1974). There is no clear indication from the literature as to preferred habitat, though most authors agree Pomarine Jaegers migrate well out to sea (Jehl 1973b, McCaskie 1975). This species was listed as a common fall migrant in the P.O.B.S.P. Eastern Grid survey area, with largest numbers encountered within 100 km of Pt. Conception (Pyle and DeLong 1968 ms). It is not clear to what extent numbers vary from year to year.

While migrating through or wintering in the study area, Pomarine Jaegers probably take a variety of schooling fishes and squid from the sea surface, in company with gulls and other seabirds. In addition, they are well known for their habit of harassing other seabirds, forcing them to regurgitate, and feeding on the regurgitated stomach contents in the air, or on the sea (Bent 1921). The ecology of *S. pomarinus* on its Alaskan North Slope breeding grounds was reviewed by Maher (1974).

1975-76 Baseline Data

April 1975. Four birds were recorded in Santa Cruz Basin, 22-40 km south of Gull Is. on the 19th. Fifteen more were recorded 25 km southwest of Pt. Fermin on the 21st.

May 1975. Three individuals in two locations: one in the Gulf of Santa Catalina on the 7th, and two more 5 and 18 km northeast of Santa Barbara Is. on the 10th. Single birds were seen 15 km north of Santa Catalina

Pomarine Jaeger (continued)

Is. on the 21st, and 36 km south of Santa Rosa Is. on the 27th. Evidently, birds of this species were scattered throughout the islands, inshore channels, and in Santa Cruz Basin in low densities all month.

June 1975. Recorded only once; a single bird 23 km south of Santa Rosa Is. on the 19th.

July 1975. Single birds of this species were seen 13 and 27 km west of San Clemente Is. on the 24th and 35 km west of Oceanside, Orange Co., on the 26th.

August 1975. Pomarine Jaegers began to migrate south through the waters of the Southern California Bight in early August. Single birds were seen at scattered locations from the 3rd to the 7th, and by the end of the month several small flocks were recorded. Most records from 24 to 30 August were inshore of San Nicolas and San Clemente Islands; the highest recorded density of Pomarine and unidentified Jaegers was in the area from 10-15 km west of San Clemente Is. on the 28th (Fig. III-A4-308). Birds seen in flocks were predominantly moving southeast.

September 1975. Pomarine Jaegers were recorded in small numbers from all areas of the Bight that we visited: a cruise from the 8th to the 13th produced several dozen records from Rodriguez Seamount and San Miguel Is., throughout the length of the Santa Rosa-Cortés Ridge, and between San Clemente Is. and the mainland. From the 22nd to the 27th, this species and unidentified jaegers were seen throughout the study area, primarily as singles or small flocks (Fig. III-A4-309). The highest density of Pomarine Jaegers were recorded near Santa Rosa-Cortés Ridge on the 10th and in Santa Monica Bay on the 23rd.

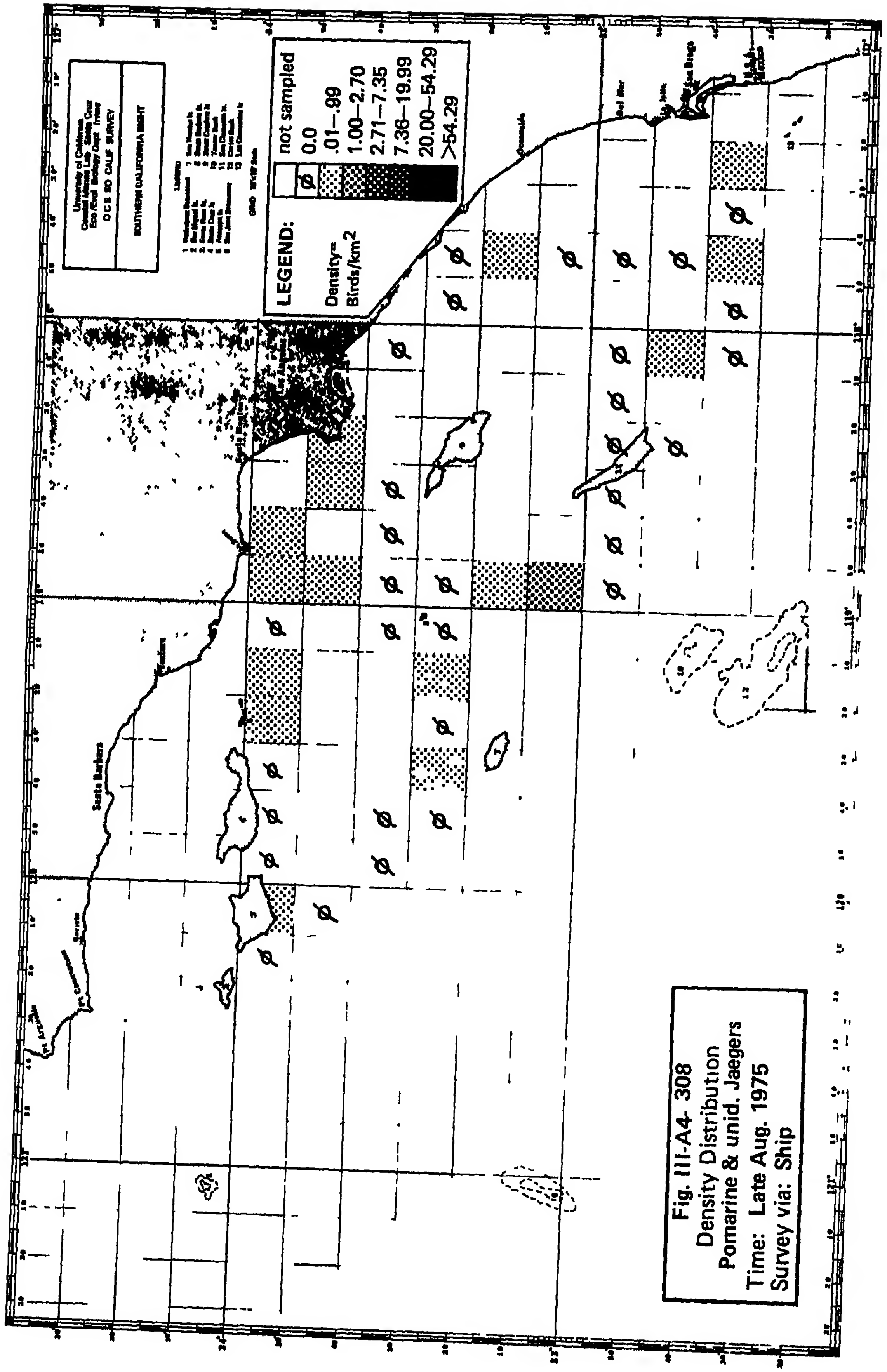


Fig. III-A4- 308
Density Distribution
Pomarine & unid. Jaegers
Time: Late Aug. 1975
Survey via: Ship

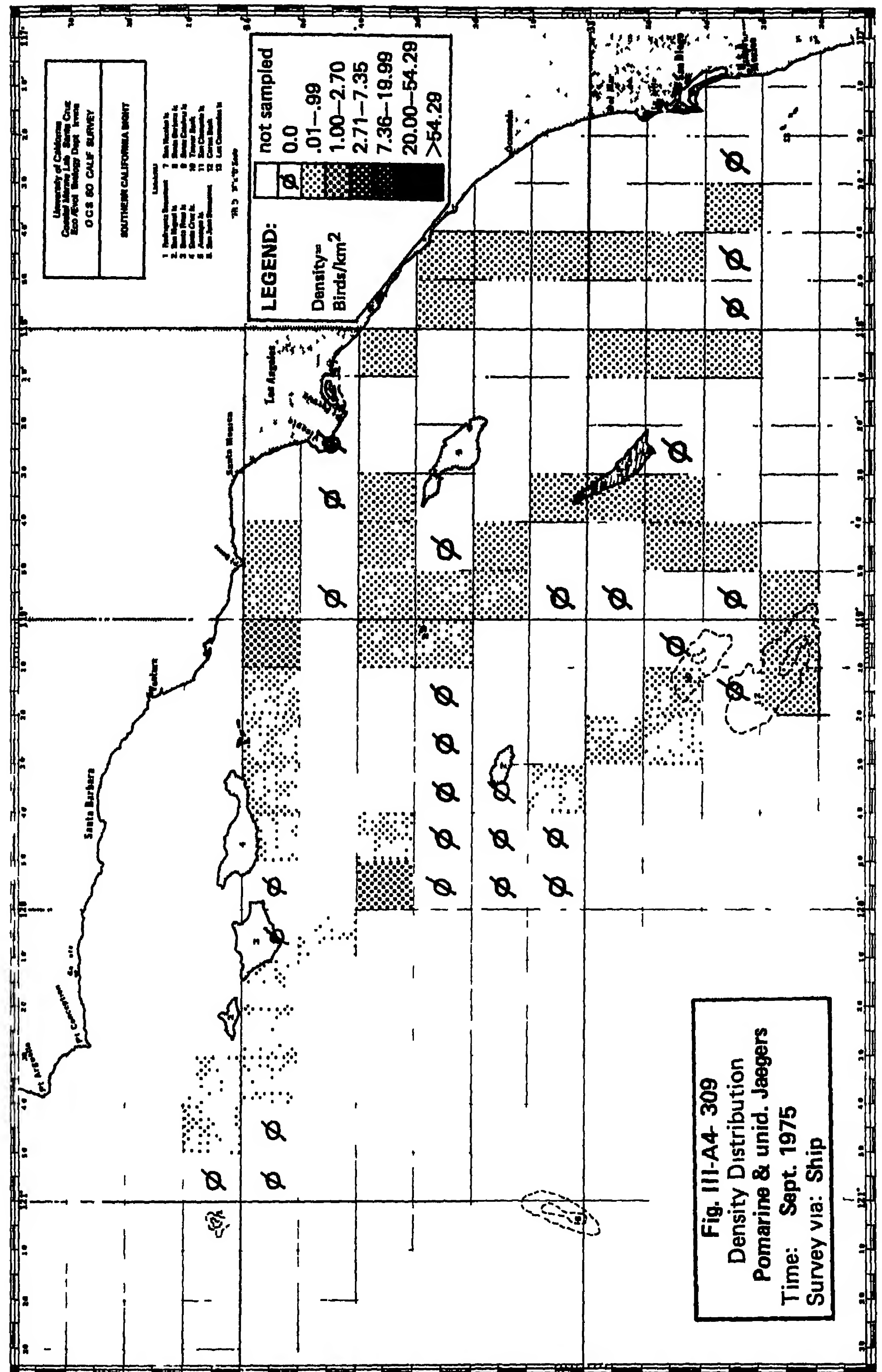


Fig. III-A4- 309
Density Distribution
Pomarine & unid. Jaegers
Time: Sept. 1975
Survey via: Ship

Pomarine Jaeger (continued)

October 1975. This species was encountered in low to high densities throughout the area west of 118°00'W. The larger numbers were recorded 10 km north of San Nicolas Is. and at sea along the 32°20'N line (Fig. III-A4-310). Most sightings were of birds moving south. Two individuals were seen at Huntington S.B., Orange Co., on the 15th.

November 1975. Light to moderate densities were recorded in waters inshore of the Santa Rosa-Cortés Ridge between the 16th and 21st (Fig. III-A4-311). The largest concentrations were part of a general massing of gulls, Brown Pelicans, and California sea lions, between Santa Barbara and San Clemente Islands on the 19th. All species were observed feeding. Pomarine Jaegers may have been present along the northern half of the Santa Rosa-Cortés Ridge at this time, but observations were hampered by rough weather.

December 1975. Pomarine Jaegers were less common in December than in the previous month in most areas visited (Fig.III-A4-312). The species was recorded only once in Santa Monica Bay and tended to be most numerous from 50-150 km off the mainland. There was no obvious migration in progress during the mid-month cruise, and it seems likely that the majority of birds seen this month were wintering in the study area.

January 1976. Low numbers of this species were recorded primarily from offshore areas (Fig. III-A4-313). None were found late in the month offshore of the Patton Escarpment. As with the birds seen in the previous month, our records were probably of overwintering individuals. Most sightings were of single birds in association with gulls.

February 1976. As in the preceding month, Pomarine Jaegers were found in low density throughout the waters of the study area, predominantly

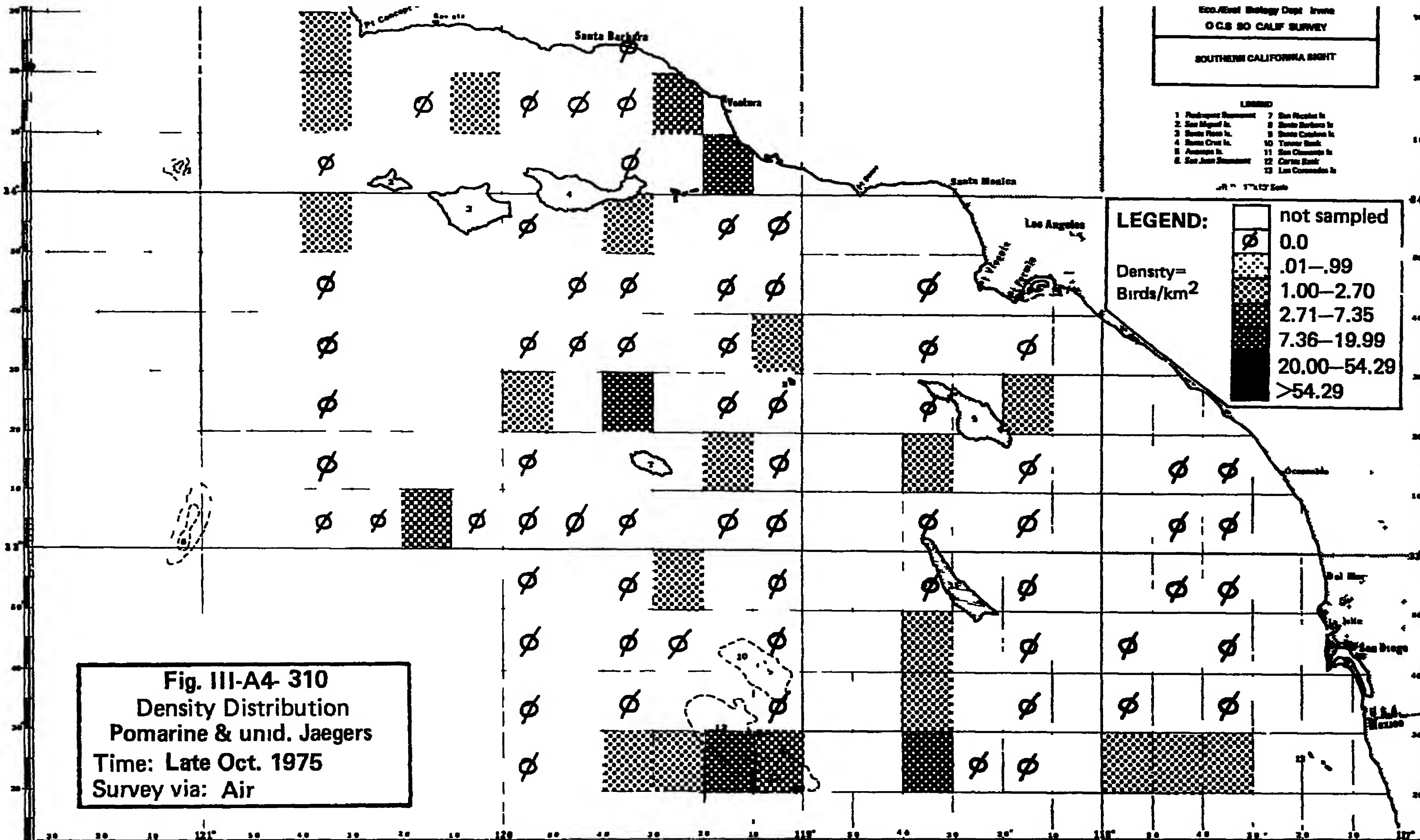


Fig. III-A4- 310
Density Distribution
Pomarine & unid. Jaegers
Time: Late Oct. 1975
Survey via: Air

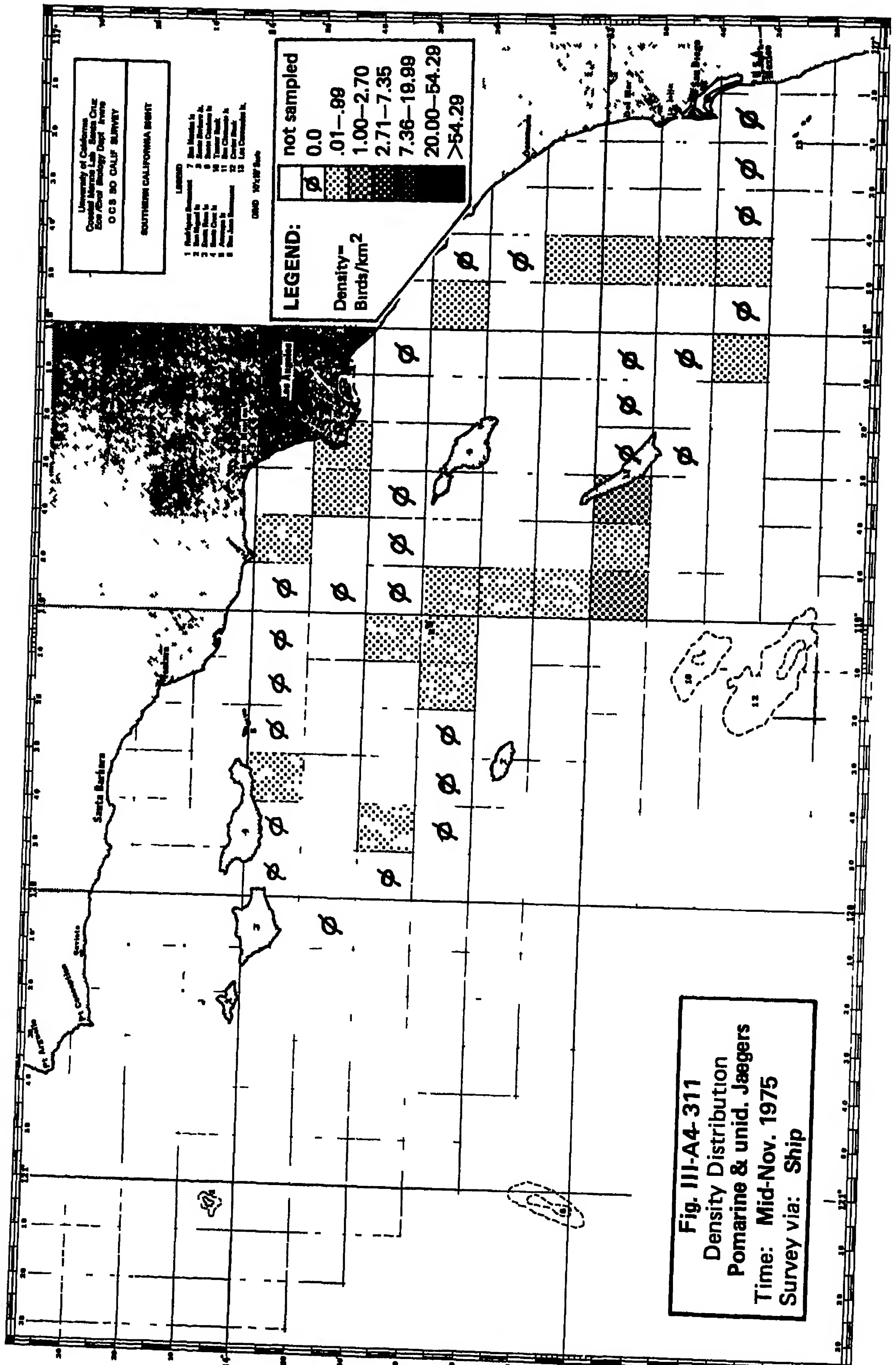


Fig. III-A4-311
Density Distribution
Pomarine & unid. Jaegers
Time: Mid-Nov. 1975
Survey via: Ship

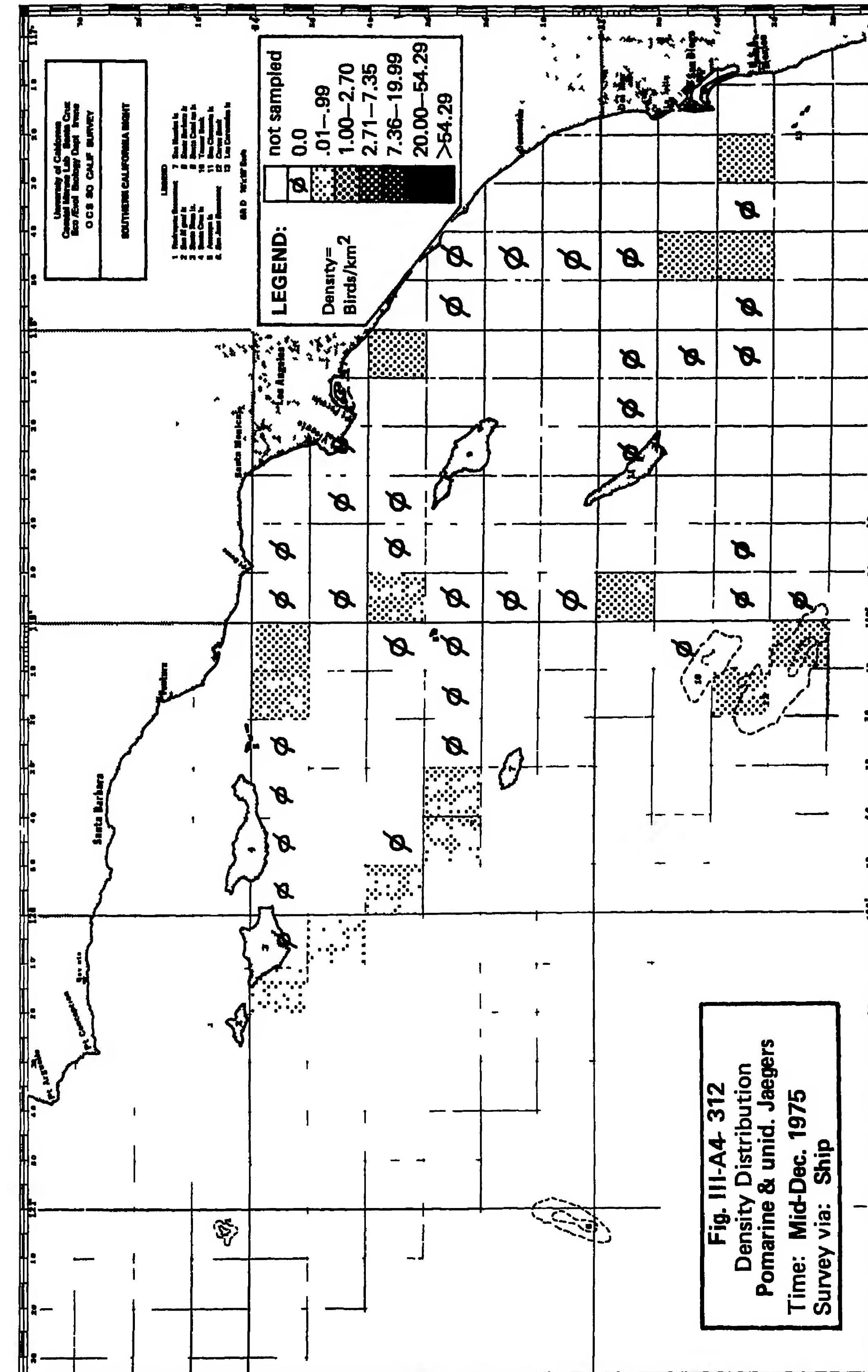


Fig. III-A4- 312
Density Distribution
Pomarine & unid. Jaegers
Time: Mid-Dec. 1975
Survey via: Ship

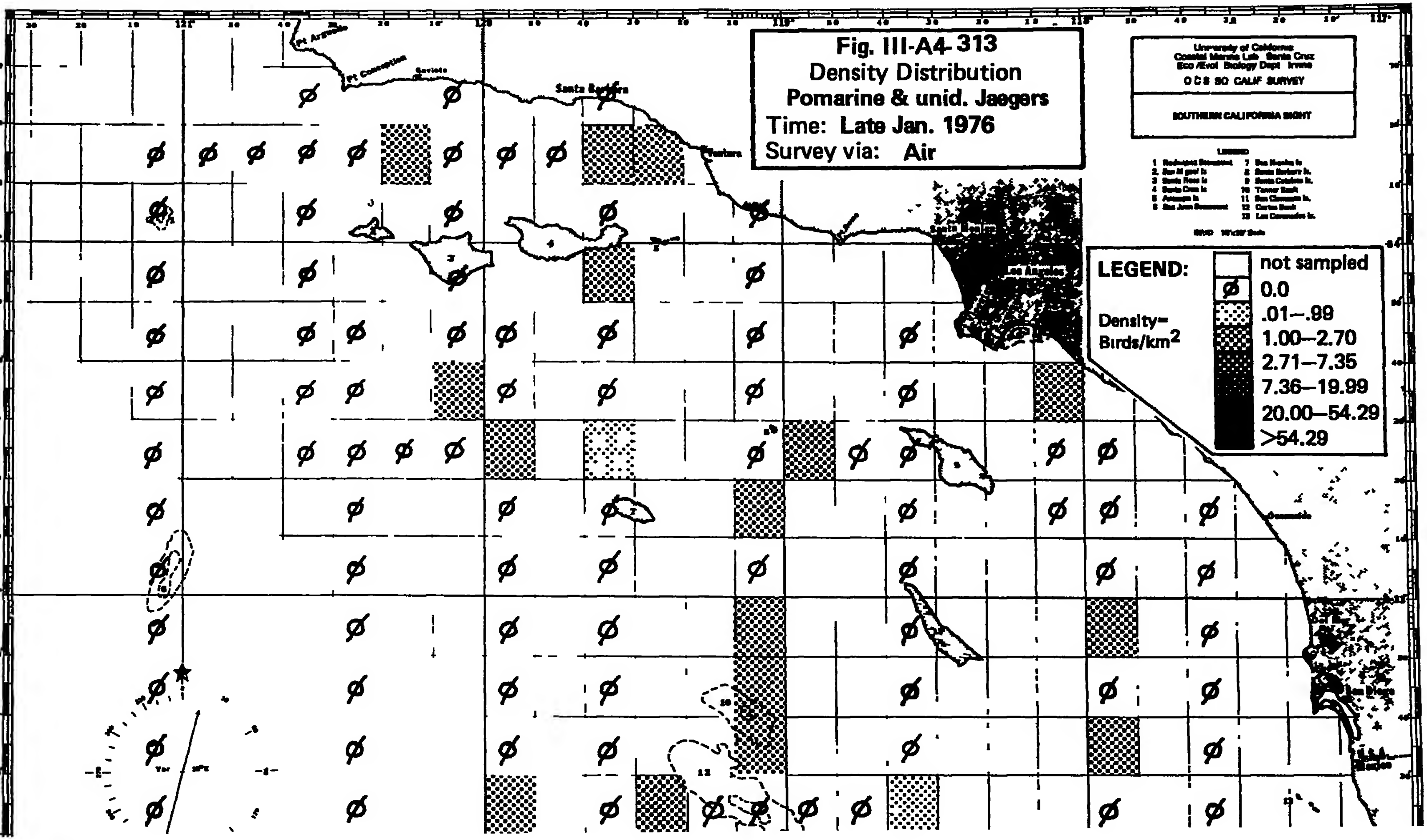


Fig. III-A4-313
Density Distribution
Pomarine & unid. Jaegers
Time: Late Jan. 1976
Survey via: Air

more than 20 km off the mainland(Fig.III-A4-314). The south side of Santa Rosa Is., northern section of the Santa Rosa-Cortés Ridge, and central-island areas harbored the largest numbers of birds, though Pomarine Jaegers were sparse everywhere. None were counted on the beaches or islands.

March 1976. One was recorded at P.M.T.C., Pt. Mugu, on the 17th. By mid-month, numbers of this species at sea were at the lowest point in six months. Only four were recorded on flights from the 12th through the 14th; single birds were found 46 km west of San Nicolas Is., 6 km north and 6 km south of Santa Barbara Is., and 3 km west of Ben Weston Pt., Santa Catalina Is. A cruise from 17 through 21 March produced records of only eight more birds: five within 10 km of Santa Barbara Is.; two at Santa Cruz Passage; one, 28 km southeast of Anacapa. Numbers of this species swelled in the two following months (April and May 1976), so it may be assumed the birds remaining in March were either the remnants of the southern California overwintering population or the vanguard of spring migrants from more southerly wintering grounds.

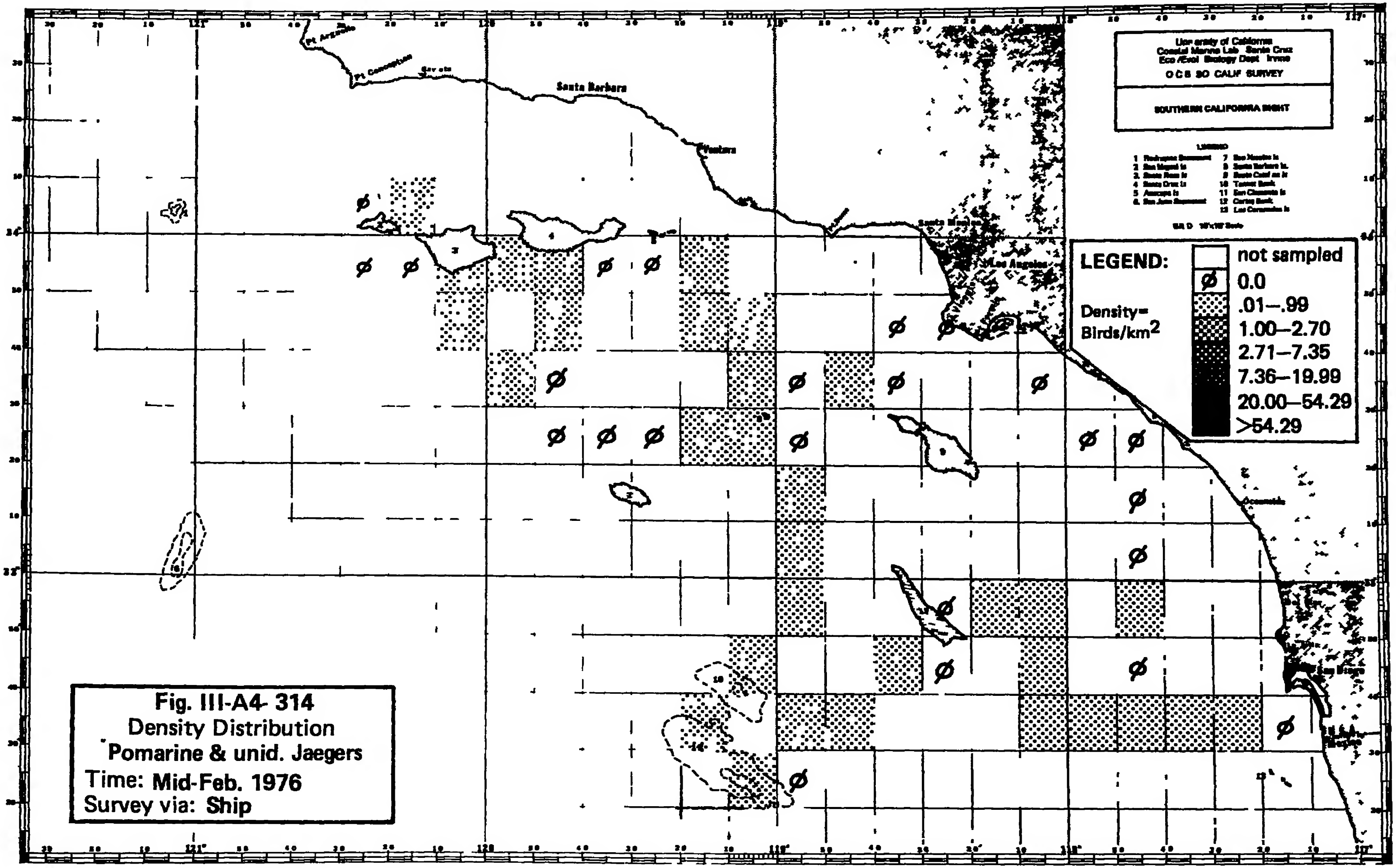


Fig. III-A4- 314
Density Distribution
Pomarine & unid. Jaegers
Time: Mid-Feb. 1976
Survey via: Ship

Parasitic Jaeger (Stercorarius parasiticus)

The Parasitic Jaeger is the smaller and less pelagic of the two common jaegers of southern California. Records of the Parasitic Jaeger from greater than 5 km off the mainland are greatly outnumbered by sightings over beaches and at coastal lagoons. The species does occasionally reach the Channel Islands (Jones in prep.) and there are records as far as 150 km offshore. Pyle and DeLong (1968 ms) reported that the species occurred casually in fall in the P.O.B.S.P. study area. Most southern California sightings are from the fall.

Foods consumed by this species are probably similar to the ones taken by Pomarine Jaegers (S. pomarinus), and both species indulge equally in "kleptoparasitism" of other seabirds (Andersson 1976). Bent (1921) and Maher (1974) provide information about the ecology of the Parasitic Jaeger on its Alaskan breeding grounds.

1975-76 Baseline Data

April 1975. None recorded.

May 1975. Recorded once at sea, 4 km off Santa Rosa Is. on the 14th, and not at all from the mainland or island beaches that we surveyed.

June - July 1975. None recorded.

August 1975. Recorded once. A single Parasitic Jaeger was sighted in Santa Monica Bay, 23 km west of Manhattan Beach, Los Angeles Co., on the 25th.

September 1975. Single Parasitic Jaegers were seen from shore at McGrath S.B., and P.M.T.C., Pt. Mugu, on the 12th and 15th, respectively, and offshore at Tanner Bank on the 11th. Moderate numbers of unidentified jaegers were recorded offshore later in the month.

Parasitic Jaeger (continued)

October 1975. Birds of this species were seen at Huntington S.B., Orange Co., (one individual, 15 October), and Dockweiler S.B., Los Angeles Co. (four birds, 16 October). The only sighting at sea was 5 km west of Ventura on the 26th.

November 1975. Our only sighting was of a single adult bird chasing a Royal Tern (*Thalasseus maximus*) at Punta Arena, Santa Cruz Is., on the 9th.

December 1975. One Parasitic Jaeger was seen off McGrath S.B. on the 5th. None were recorded at sea.

January 1976. Single adults recorded at Pozo Anchorage, Santa Cruz Is. on the 18th, and 3 km off Rincon Pt., Ventura Co., on the 27th.

February 1976. None recorded.

March 1976. A single immature bird, 7 km north of Santa Barbara Is. on the 17th.

Long-tailed Jaeger (Stercorarius longicaudus)

Long-tailed Jaegers occur rarely, and only as migrants, in the waters of the Southern California Bight; reports of more than a few individuals in a given season are exceptional. The species nests in the high Arctic and may depart south from its breeding grounds a week or two earlier than the sympatric Pomarine and Parasitic Jaegers (Maher 1974, Brown et al. 1975). Autumn records from southern California include dates from 3-4 September through the end of October (McCaskie 1966a, Jehl 1973b). There are no records from winter, spring or summer from the study area (Scott 1974), and it has been proposed their northward migration in spring is inland over the interior of the United States, at high altitude (Unitt 1975 ms).

Long-tailed Jaegers seem to be most common in offshore waters in fall. Pyle and DeLong (1968 ms) reported the species from the P.O.B.S.P. Eastern Grid (which was about 90 km from the southern California mainland at its closest point), and Jehl (1973b) sighted an unprecedented 16 individuals near offshore banks and beyond the 1,000 fathom (1,832 m) isobath in mid-October 1971.

1975-76 Baseline Data

One record, see Volume III, p. III-605.

Glaucous-winged Gull (<u>Larus glaucescens</u>)

Glaucous-winged Gulls nest coastally from western Alaska to Washington and winter south to Baja California in the eastern Pacific. The species is uncommon, but regular in waters offshore of southern California as far out as 370 - 555 km; immature birds probably occur in greater numbers far offshore than adults (Sanger 1973, Harrington 1975). Offshore records from the P.O.B.S.P. Eastern Grid study area were from the months of January through April (Harrington 1975). Sanger (1973) concluded that birds found far offshore move there actively rather than being blown there passively.

The species is most numerous close to the coast. Howell (1917) described the Glaucous-winged Gull as a regular, but not plentiful winter resident among the Channel Islands. Devillers et al. (1971) reported that typically 200 - 300 individuals over-wintered in the San Diego area in recent years, primarily in garbage dumps and coastal embayments. The first migrants arrive in southern California in late October and numbers taper off in March. A few immatures may stay through the summer. They occur regularly in northern Baja California, primarily on the Pacific Coast and offshore islands (including Isla de Guadalupe). Adults are greatly outnumbered by immatures south of Pt. Conception, and there is some evidence that second-year birds arrive earlier in the San Diego area than do first-year individuals (Devillers et al. 1971).

As is the case with the other large gulls that winter in southern California, Glaucous-winged Gulls feed to a variable extent on carrion, garbage, fish offal, pelagic crustaceans (<u>Lepus</u>), and schooling bait fishes (Bent 1921, Devillers et al. 1971).

1975-76 Baseline Data

April - September 1975. None recorded.

October 1975. A total of nine Glaucous-winged Gulls were sighted between 23 and 26 October. Seven were found from 1-15 km west of Ventura, one was found at Santa Barbara Is., and one approximately 30 km south of San Clemente Is. All were immature.

November 1975. A single immature was seen at Dockweiler S.B., Los Angeles Co., on the 6th. Two more were seen at sea: one 17 km west of Los Angeles, and one 37 km northwest of San Clemente Is.

December 1975. One juvenile Glaucous-winged Gull was recorded on the 5th at McGrath S.B., Ventura Co.; two were seen at China Harbor, Santa Cruz Is. on the 6th; a fourth was seen 3 km west of Pt. Vicente on the 15th.

January 1976. On January 6, we observed and photographed 230 Glaucous-winged Gulls among hundreds of Western and Herring Gulls at Pt. Bennett, San Miguel Is., five more in Tyler Bight, San Miguel Is., and an additional eight near the northwest end of San Nicolas Is. These birds were apparently all immatures. To our knowledge, the flock on San Miguel is the largest ever recorded from the Southern California Bight. On the same day, single birds were observed approximately 10 km south of East Pt., Santa Rosa Is., and 22 km south of Santa Barbara Is. in Santa Barbara Channel (Table III-A4-176) gives the distribution of 15 individual sightings at mainland beaches from 12-14 January. On the 24th, a single immature bird was sighted at 32°25'N, 121°00'W, approximately 160 km southwest of San Nicolas Is.

February 1976. Only three Glaucous-winged Gulls were seen during two mid-month cruises: one near Pt. Bennett, San Miguel Is.; one 8 km west

Table III-A4-176. Distribution of sightings of Glaucous-winged Gulls at mainland and Santa Cruz Island beaches in January and February, 1976.

Date	Location	Adult	Immature
12 January	Border Field S.B.	1	1
	Silver Strand S.B.	1	
13 January	McGrath S.B.		1
	P.M.T.C., Pt. Mugu	4	5
	Mugu S.B.		2
18 February	Dockweiler S.B.	1	
	P.M.T.C., Pt. Mugu	2	1
19 February	McGrath S.B.	2	2
21 February	China Cove, Santa Cruz Is.		2
24 February	San Onofre S.B.	1	

Table III-A4-177. Numbers and locations of Glaucous-winged Gulls sighted during aerial surveys of San Miguel, Santa Rosa and San Nicolas islands in January and March 1976. All were apparently immature birds.

Date	Location*		Number
6 January	San Miguel	110	230
		150	5
	San Nicolas	210	8
23 January	San Nicolas	231	8
24 January	San Miguel	110	67
		111	7
		114	26
		116	1
		170	1
25 January	Santa Rosa	622	2
14 March	San Miguel	102	5
		103	2
		115	150
		118	63
		145	1
	San Nicolas	202	2
15 March	Santa Rosa	624	3

*Numbers refer to specific location codes on Figures III-178-179 and 182.

Glaucous-winged Gull (continued)

of Pt. Vicente; one 9 km south of Santa Cruz Is. Table III-A4-176 shows the distribution of sightings of this species on mainland beaches from 18 - 20 February.

March 1976. As in January, we recorded fairly large numbers of Glaucous-winged Gulls on the beaches of San Miguel Is. mid-month, with small numbers elsewhere (Table III-A4-177). One bird, 18 km north of Prince Is. was the only sighting at sea. Three were recorded at Dockweiler S.B. on the 16th and five more at Forney Cove, Santa Cruz Is. on the 19th.

Western Gull (<u>Larus occidentalis</u>)

The breeding range of the Western Gull extends from Baja California to British Columbia, along coastal areas and on offshore islands, overlapping slightly in Mexico with that of the Heermann's Gull (*L. heermanni*) and in the north with the Glaucous-winged Gull (*L. glaucescens*).

This is the only gull that nests on the California coast. It nests on each of the Channel Islands, and occurs commonly on southern California mainland beaches, refuse disposal sites, and marinas. The reproductive biology of Western Gulls in California has been the focus of much recent research (reviewed in Schreiber 1970, Hunt and Hunt 1975, Pierotti 1976).

Banding studies conducted in the 1930's through 1940's and 1965 to 1975 have yielded information about dispersal of young birds. Woodbury and Knight (1951) and Coulter (1975) indicate that throughout the breeding range first- and second-year birds tend to move south from the colonies where they hatch, rarely going more than a few kilometers inland from the coast. There seems to be a difference in dispersal tendency related to the geographic locations of natal colonies. Birds banded in the northern part of the range (north of central California) disperse relatively greater distances to the south. Birds from southern California colonies either stay there or move only slightly to the south. Hunt and Hunt (1975) reported the opposite tendency, i.e., dispersal to the north, among a small sample of birds banded on Santa Barbara Is. Coulter (1975) pointed out that the dispersal patterns of southern California Western Gulls will remain incompletely known until more work is done along the sparsely-populated (by ornithologists) Pacific coast of Baja California. All authors report that adults tend to remain in the vicinity of their nesting

islands throughout the year and do not wander to the extent that younger birds do.

Western Gulls apparently do not travel far out to sea. Yocum (1947), Sanger (1973), and Harrington (1975) all show the species most common within sight of land and rarely found beyond 100 km offshore. Interestingly, the latter two authors show that adults travel farther offshore than immatures (in contrast to the situation with the migratory Glaucous-winged Gull). Very little published information is available concerning distribution or habits of Western Gulls in southern California offshore waters or on the Channel Islands in the non-breeding months.

Western Gulls feed on a variety of items. They are known to frequent garbage dumps and fish docks, to take intertidal invertebrates, squid and schooling fish, and to kill other nesting seabirds. Schreiber (1970) and Hunt and Hunt (1976) both report feeding on the placentae of California sea lions during the nesting season, and Briggs (unpubl.) has documented feeding on placentae and other carrion of northern elephant seals in winter in central and southern California.

Little is known of mortality factors in Western Gull populations. Coulter (1975) reported that heaviest mortality tends to occur among young birds shortly after fledging and through fall and early winter. The adult mortality rate is lower than that among juveniles and is concentrated in June through September.

Information concerning the historical breeding status of this species is included in App. III-A3. Breeding status data collected during the 1975-76 season are summarized in Table III-115.

In the following account, reference is made to Table III-125.

1975-76 Baseline Data

April 1975. We encountered Western Gulls in moderately low densities on a transect between Santa Rosa and Santa Barbara Islands on the 19th. Four adults were seen between 8 and 22 km southeast of Gull Is., and six more of mixed ages in Santa Cruz Basin, 37 km northwest of Santa Barbara Is. None were encountered between Santa Barbara Is. and Pt. Fermin on the 21st.

Table III-125 presents numbers of Western Gulls at mainland and island beaches from April, 1975, through March, 1976. Although two beaches were not sampled in April, there is a clear tendency toward higher numbers along northern mainland and Santa Cruz Is. beaches than on Orange and San Diego County beaches. Beach counts were generally low in April, probably reflecting a tendency for adult birds to remain in the vicinity of nesting islands.

May 1975. Western Gulls were found in all areas sampled from ships from the 7th through the 27th. The highest densities recorded were near San Miguel Is., near the south side of Santa Cruz Channel, and northwest of Santa Barbara Is. (Fig. III-A4-315). Aerial transects alonq the 118° and 118°30'W lines on the 16th produced records in only three locations: 46 km east of the north tip of San Clemente Is. (three birds), 5 km south of Long Beach (one bird), and 5 km north of Santa Catalina Is. (three birds). We did not reach areas seaward of San Clemente and San Nicolas Islands.

Table III-125 shows that sightings of Western Gulls on beach censuses were concentrated at McGrath S.B. and Santa Cruz Is., while numbers were relatively small at Orange and Los Anoeles County beaches. The low density of Western Gulls found at sea east of Santa Catalina and

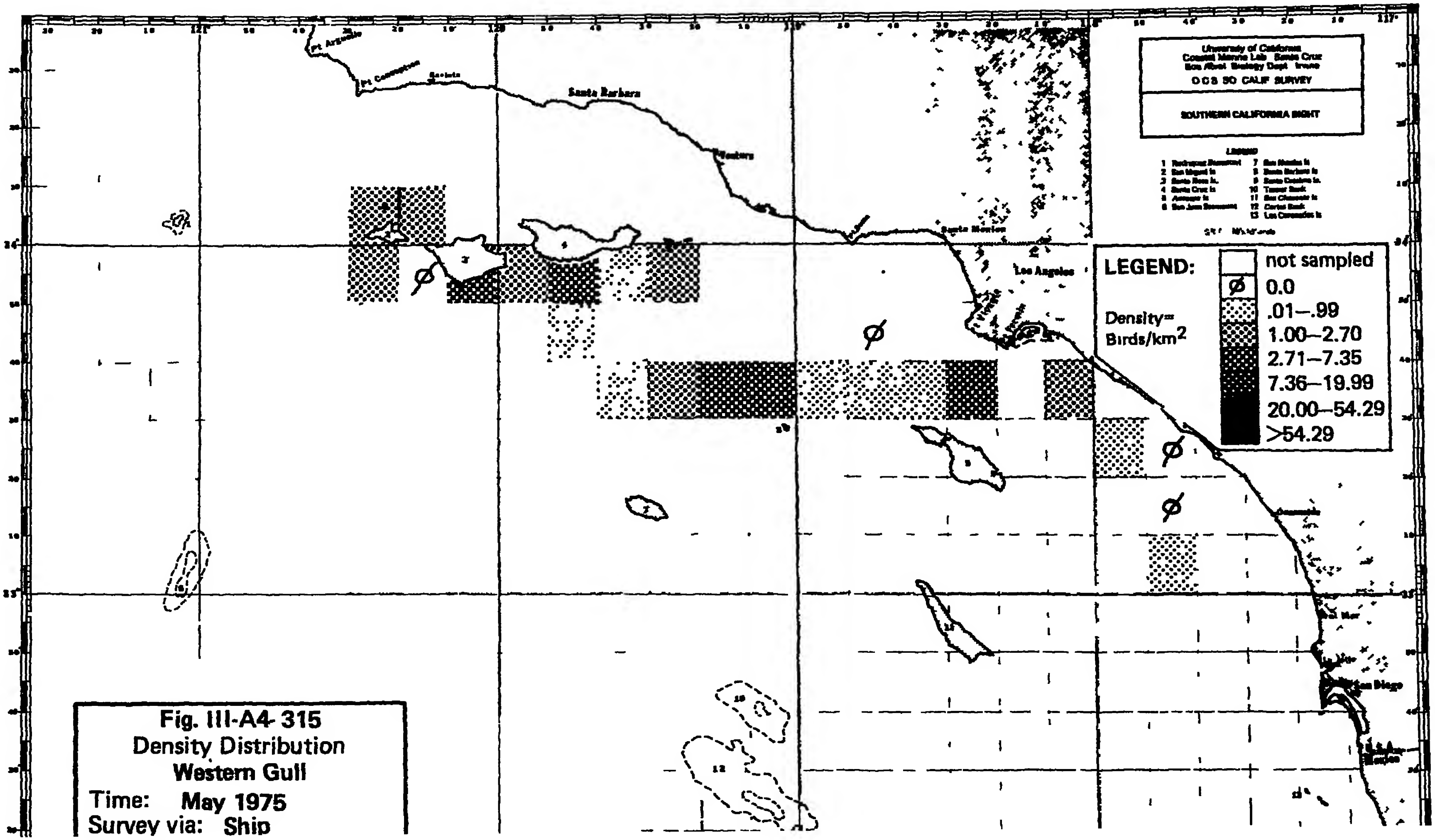
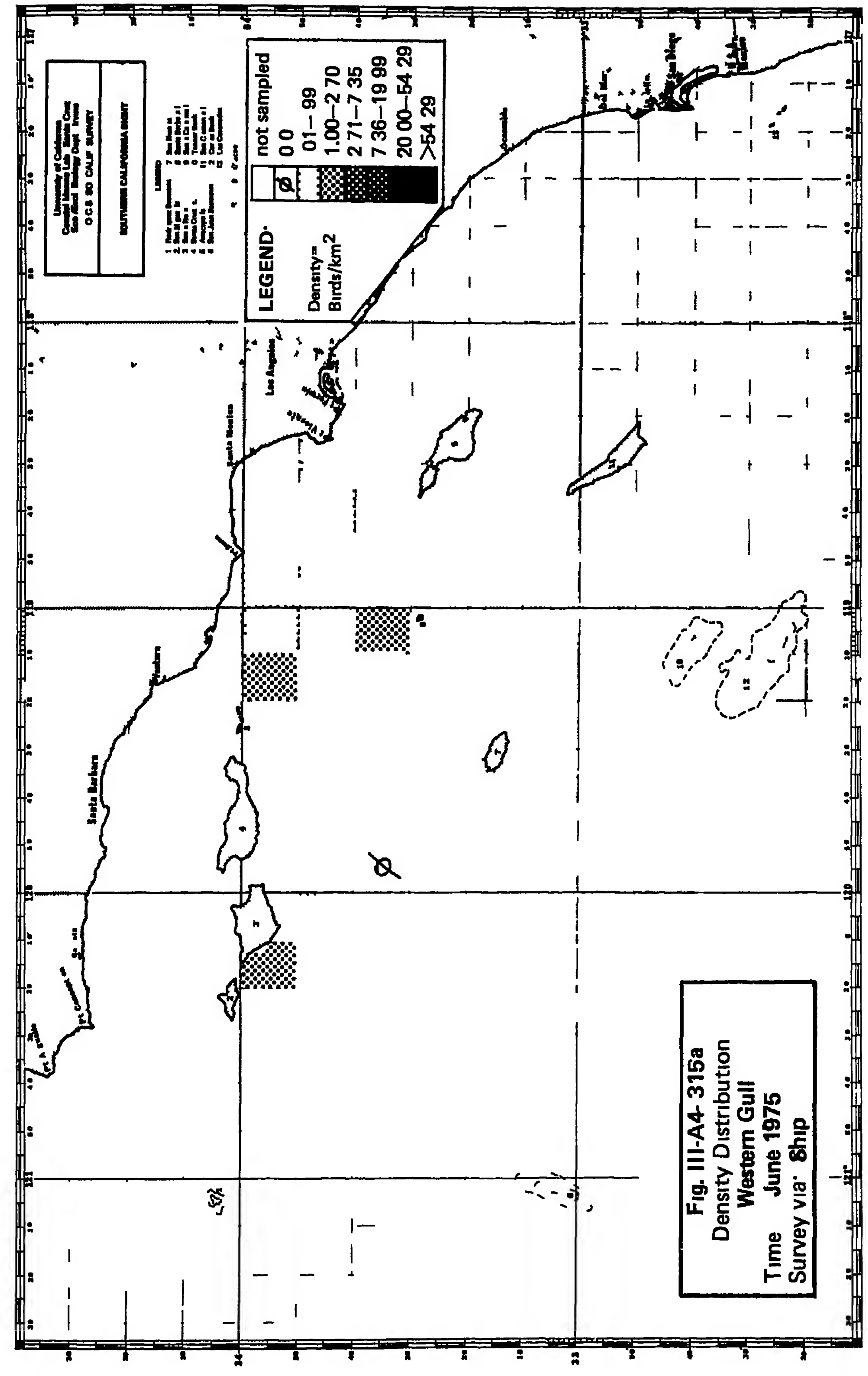


Fig. III-A4-315
Density Distribution
Western Gull
Time: May 1975
Survey via: Ship

San Clemente Islands was paralleled on the mainland by relatively low numbers of birds at central and southern beaches. This pattern probably reflects the restriction of breeding adults to the vicinity of their nesting islands and the concentration of these areas west of 118°30'W and north of 33°N.

June 1975. Beach censuses conducted from the 13th to the 19th revealed an increase in total sightings over the previous month. The number of Western Gulls at Ventura Co. and Santa Cruz Is. beaches remained high, and there were many more birds recorded at San Diego and Orange Co. beaches than in May. (Fig. III-A4-315a). Ship transects among the northern and central islands yielded relatively low densities of birds at sea. Aerial counts (Fig. III-A4-316) from the 27th through the 30th indicated that Western Gulls tended to be most dense near islands having large gull nesting colonies. The species was absent in offshore waters more than 120 km from the mainland. Densities were generally low east of 118°30'W and peaked in the vicinity of Santa Barbara, Santa Rosa, and San Miguel Islands, and near Pt. Conception. Aerial surveys of island beaches from the 27th to the 30th showed very large numbers of Western Gulls at San Miguel and Santa Barbara Islands, and much lower numbers at Santa Rosa, Santa Catalina, and San Clemente Islands (Table III-A4-178).

July 1975. Mid-month beach censuses yielded about the same total number of Western Gull sightings as in the previous month: 1,192 in July compared with 1,216 in June. Birds were most numerous on Los Angeles and Ventura Co. and Santa Cruz Is. beaches, and less so in the San Diego area. Ship transect work in mid-to-late July revealed a pattern of Western Gull distribution similar to that of the preceding month


LEGEND:
Density = Birds/km2
not sampled
0 0
01 — 99
1.00 — 2 70
2 71 — 7 35
7 36 — 19 99
20 00 — 54 29
>54 29
Los Angeles
Santa Barbara
Fig. III-A4- 315a
Density Distribution
Western Gull
Time June 1975
Survey via: Ship

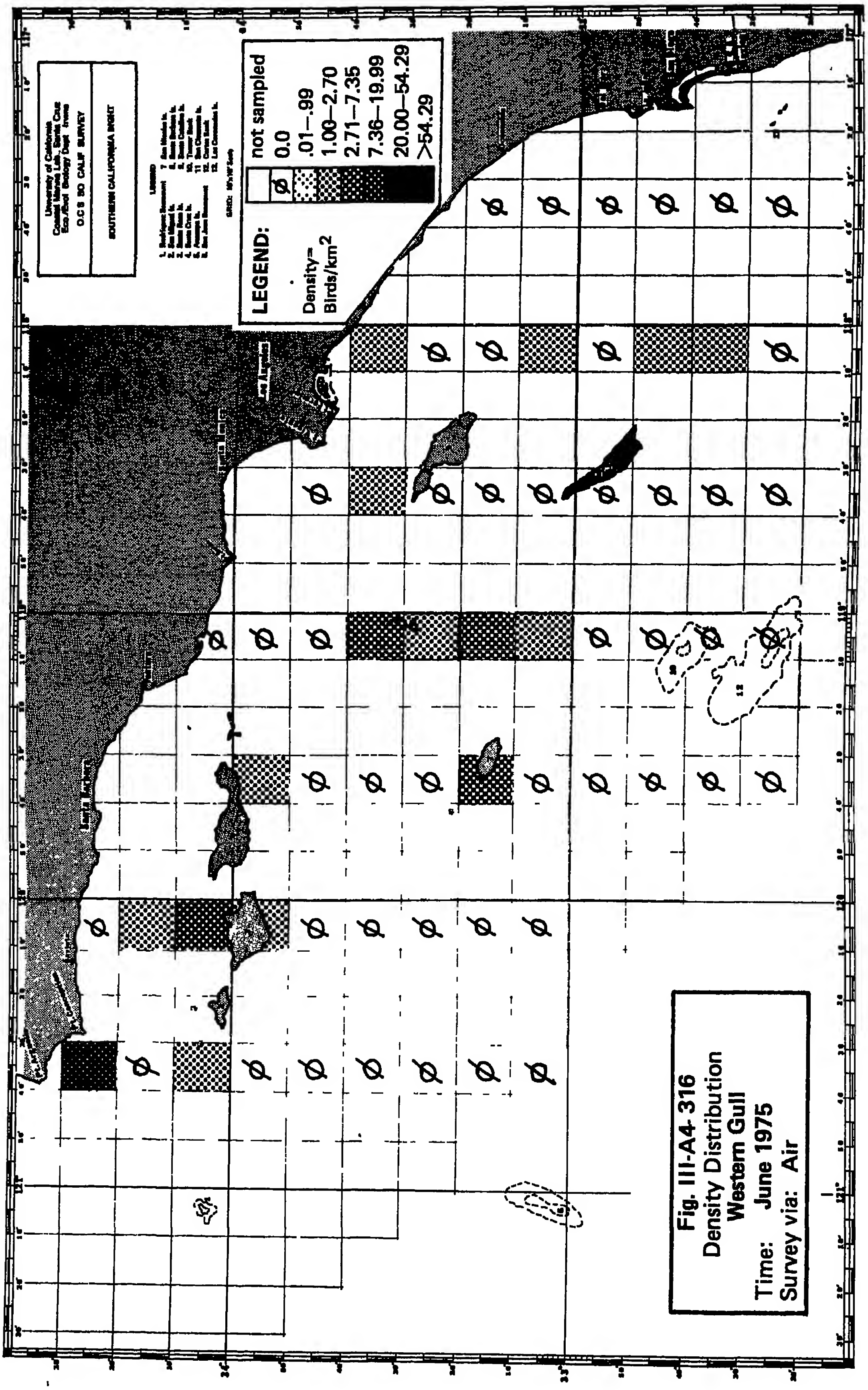


Fig. III-A4-316
Density Distribution
Western Gull
Time: June 1975
Survey via: Air

Table III-A4-178.

Frequency of sightings of Western Gulls (total individuals)on and near Channel Island beaches, April 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Date→	27-30 Jun 75	14-18 Jul 75	4-7 Aug 75	23-26 Oct 75	16-19 Dec75	21-24 Jan 76	11-14 Feb 76	12-14 Mar 76
Location Type→	Air	Ship	Air	Air	Air	Air	Ship	Air
SAN MIGUEL IS.								
Richardson Rk. (103)	25		12	3	25	7	-	50
West (102,110-20,160,170)	118		77	55	-	134	26	179
South (146-51)	20		6	13	-	59	28	3
East (101,140-45)	698		493	-	-	96	323	190
North (121-40)	15		3	47	-	75	31	5
SANTA ROSA IS.								
West (611-12,625)	0		186	16	17	182	-	19
South (620-24)	18		5	3	49	201	178	582
East (618-19,629)	13		2	0	77	242	-	74
North (610,613-17)	11		204	50	1	78	-	0
SANTA CRUZ IS.								
West (641,658)	33		27	197	-	22	-	12
South (650,653-56)	33		85	186	-	43	320	0
East (649,651)	63		119	4	-	0	-	58
North (640,643-48)	178		145	70	-	61	-	142
ANACAPA IS. (660-80)	-		-	-	-	-	5532	-
SAN NICOLAS IS.								
Northwest (210-60)	-		60	545	-	987	-	140
Southwest (203)	64		81	10	-	123	-	14
Southeast (202)	0		-	218	-	358	-	39
Northeast (201)	2		-	20	-	91	-	14
SANTA BARBARA IS.(300-330)	977		122	384	-	220	-	-
SANTA CATALINA IS.								
Northwest (506-07,515, 525-27)	26		14	41	-	502	226	-
Southwest (503-05,529)	55		7	68	-	20	-	-
South (502,523-24)	17		2	0	-	19	-	-
East (501,509-11)	9		8	8	-	0	49	-
Isthmus (508,521-522)	3		0	0	-	1150	230	-
SAN CLEMENTE IS.								
Northwest (409-11)	10		35	28	2	125	-	25
West Central (406-08)	9		29	73	15	330	-	20
Southwest 404-05)	28		10	51	0	1	-	-
Pyramid Cove (402-03)	6		5	8	-	-	-	-
East 401,412)	24		0	0	-	3	-	-

Fig. III-A4-317).). Except for one local "hotspot" approximately 37 km southwest of San Diego, birds were sparse east of 118°30'W. Larger numbers were encountered close inshore near San Clemente Is., in a 40-km circle centered at Santa Barbara Is., and near the four northern islands.

August 1975. Aerial surveys early in the month indicated that Western Gull distribution was similar to that in late July. Except for scattered groups of gulls, most sightings were from the Santa Barbara Channel/ northern islands area, or near other islands. Interestingly, heavy concentrations were seen along the mainland coast. Few Western Gulls were seen east of 118°30'W, except near shore (Fig. III-A4-318).

Aerial surveys of the islands revealed large numbers on San Miguel, Santa Rosa, and Santa Cruz Islands, and fewer on Santa Catalina and San Clemente Islands (Table III-A4-178). San Nicolas and Santa Barbara Islands were not surveyed completely. Beach walks conducted from 1-7 August showed Western Gulls to be more numerous at beaches bordering Santa Barbara Channel than elsewhere. The species was absent from the two Orange Co. beaches, Huntington and San Onofre.

A shipboard survey late in the month showed a surprising abundance of Western Gulls east and southeast of San Clemente Is. and lower densities in the northwestern quarter of the study area (Fig. III-A4-319). The gulls encountered east of San Clemente Is. were associated with Brown Pelicans and hundreds of storm-petrels. The main concentration in that area was along the Coronados Escarpment, 15 km west of San Diego. As usual, the area between Santa Barbara Is. and Pt. Dume, Ventura Co., produced many sightings.

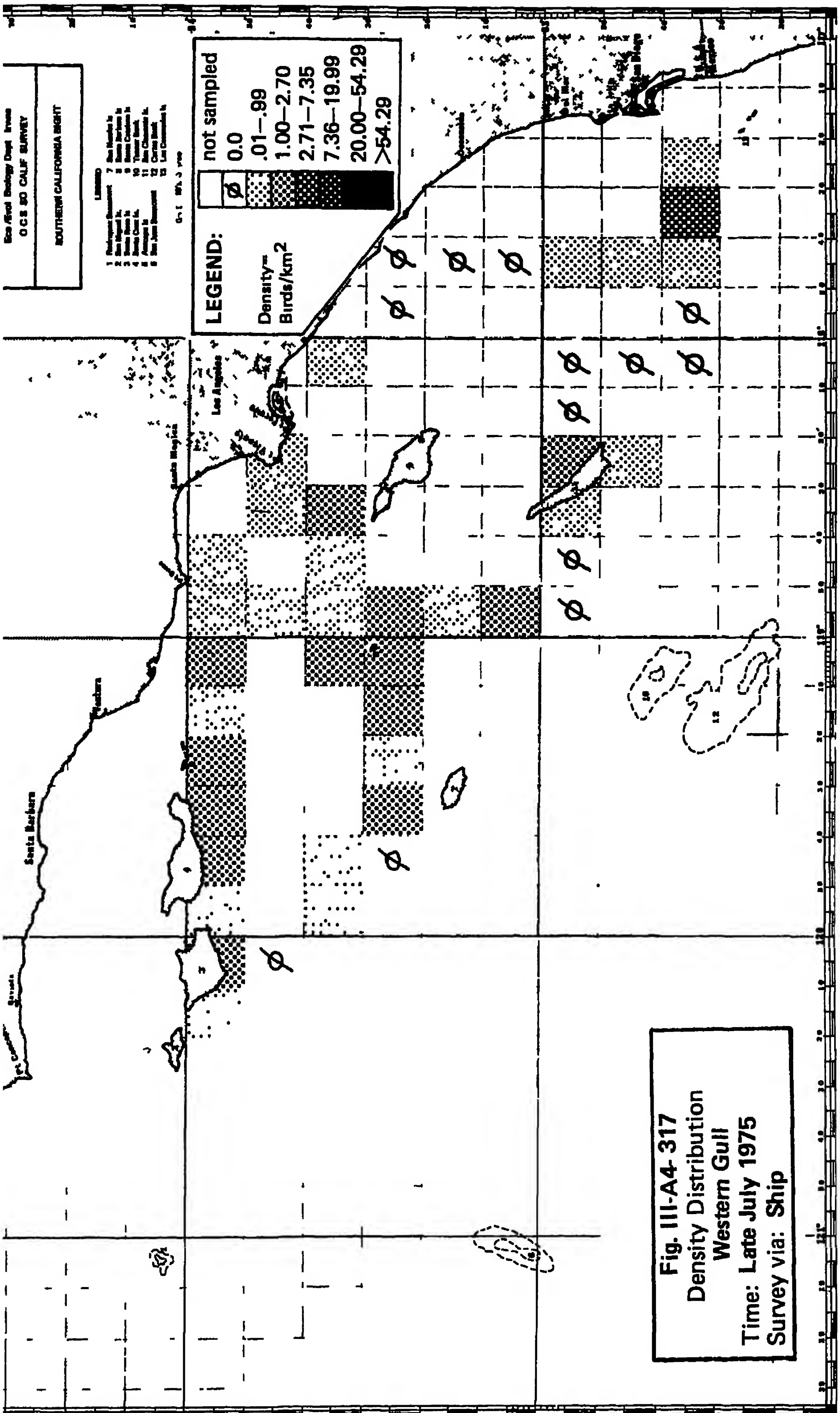


Fig. III-A4-317
Density Distribution
Western Gull
Time: Late July 1975
Survey via: Ship

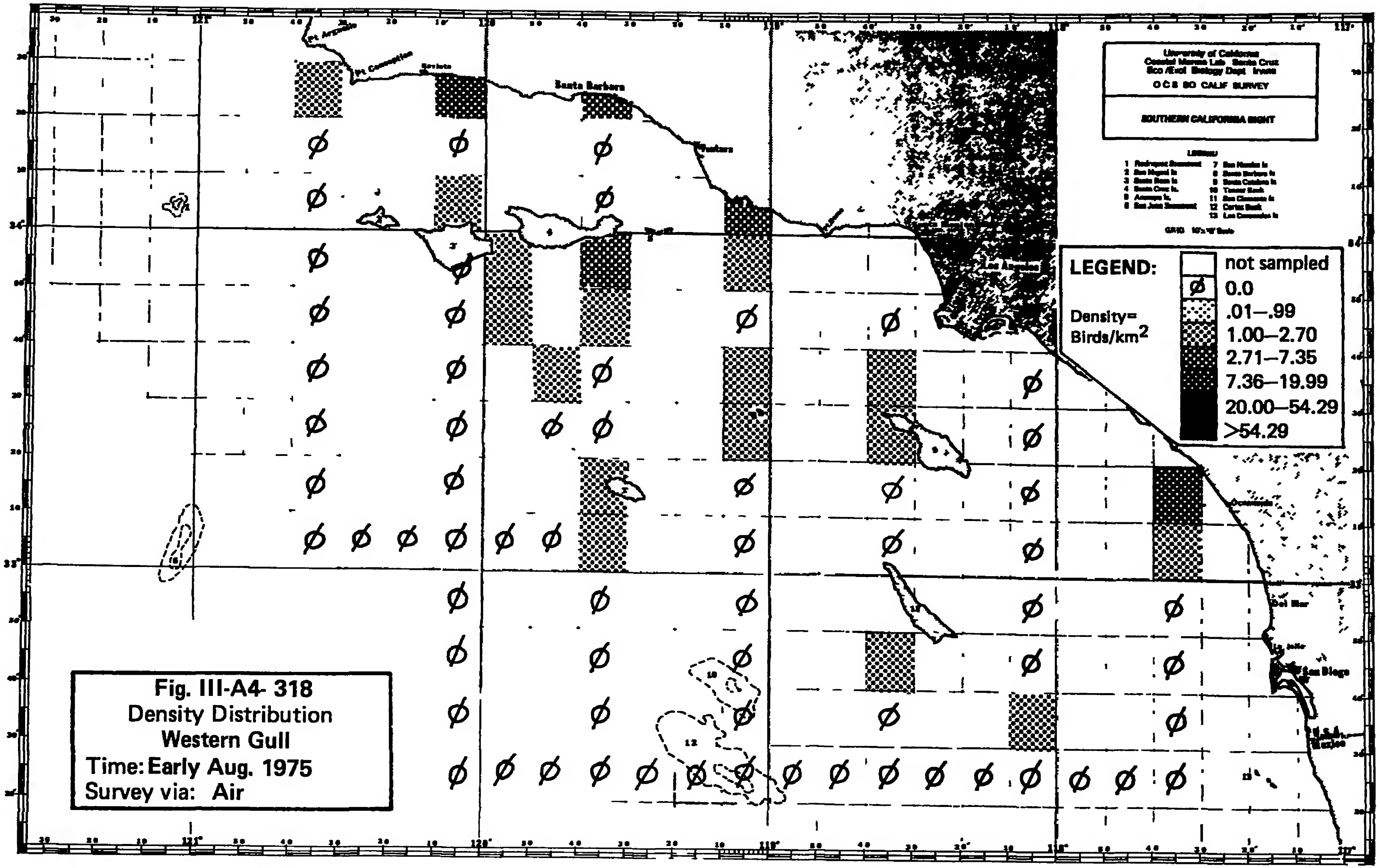


Fig. III-A4- 318
Density Distribution
Western Gull
Time: Early Aug. 1975
Survey via: Air

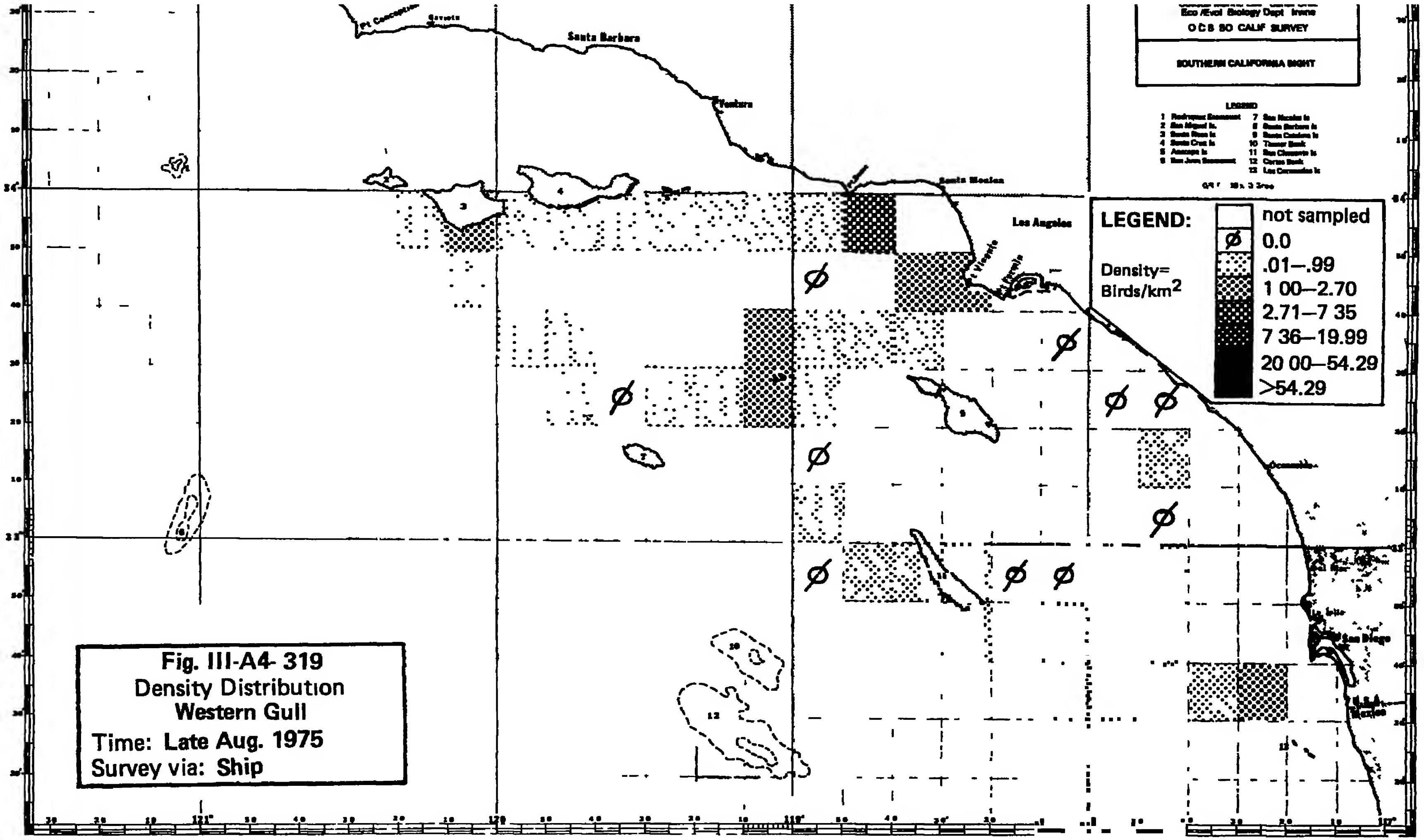


Fig. III-A4- 319
Density Distribution
Western Gull
Time: Late Aug. 1975
Survey via: Ship

Western Gulls (continued)

September 1975. Beach censuses done from the 11th to the 18th indicated an upswing in total numbers over those of the previous several months. This was particularly true at McGrath S.B., where over 1,400 birds were counted. Numbers were generally low at southern beaches (Table III-125).

Extensive shipboard surveys in mid- and late September revealed a surprising pattern of distribution at sea (Fig. III-A4-320). For the first time, juveniles appeared in large numbers offshore. They were abundant in the immediate vicinity of San Miguel Is., becoming uncommon near Rodriguez Seamount. Birds of all ages were common to abundant near San Nicolas and Santa Barbara Islands and at Cortés Bank. As in the previous month, Western Gulls were common near Pt. Vicente and San Clemente Is. and uniformly uncommon between San Clemente Is. and the mainland. This shift of distribution to offshore areas, particularly Cortés Bank, was paralleled by an abundance of California sea lions in the same waters.

October 1975. Beach-walk data collected in mid-month were similar to those from September, but total numbers declined (Table III-125). McGrath S.B. harbored large numbers of gulls as usual. Concurrent aerial surveys over island beaches revealed large numbers concentrated at Santa Cruz, San Nicolas, and Santa Barbara Islands (Table III-178).

Aerial surveys over open-ocean waters in mid-month revealed very high densities in several widely scattered areas (Fig. III-A4-321). Western Gulls were abundant in eastern Santa Barbara Channel and south of the four northern islands. Waters near the central islands, San Nicolas and Santa Barbara Islands, harbored moderate densities, and very large numbers were encountered east of Santa Catalina Is. Surprisingly, the species was

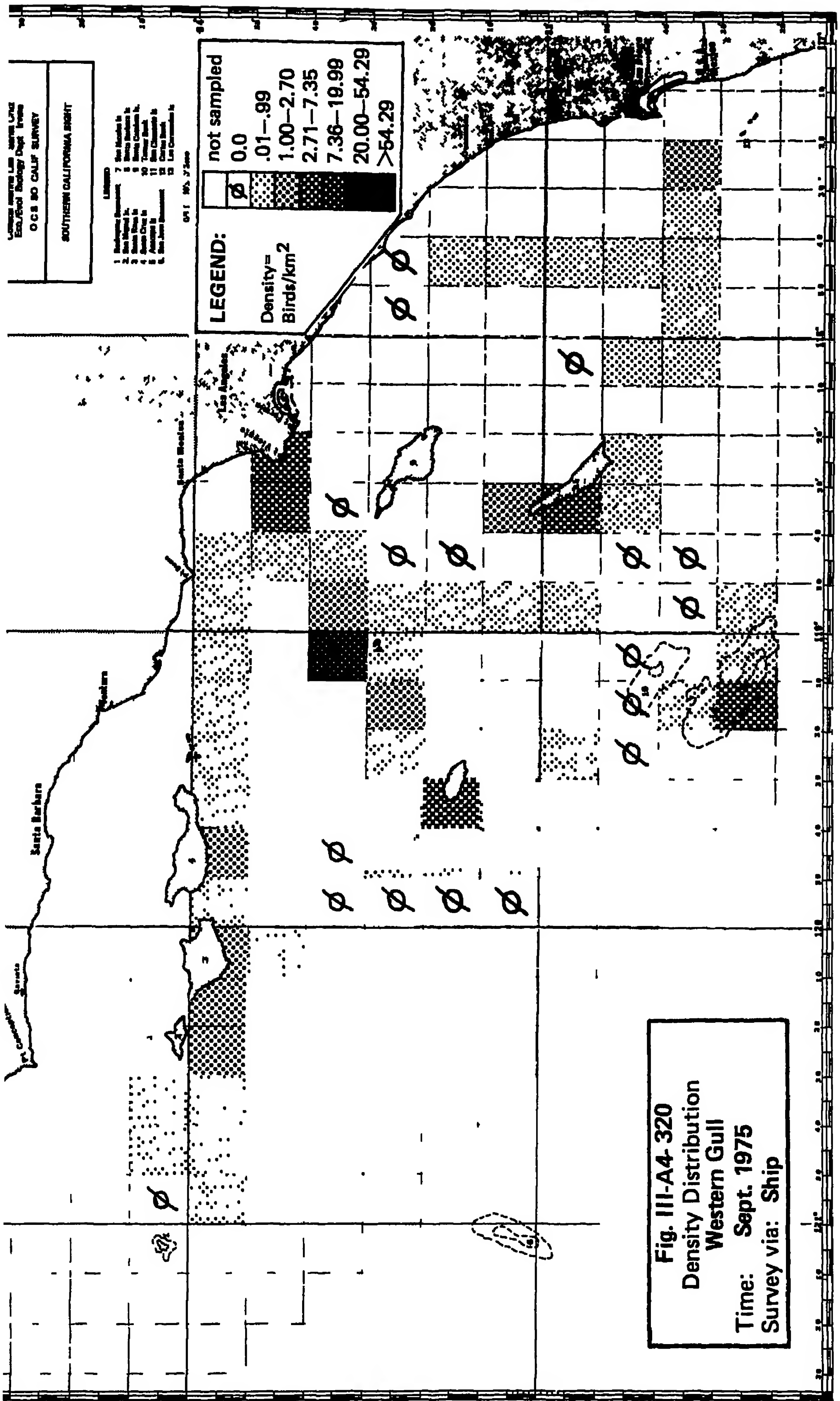


Fig. III-A4-320
Density Distribution
Western Gull
Time: Sept. 1975
Survey via: Ship

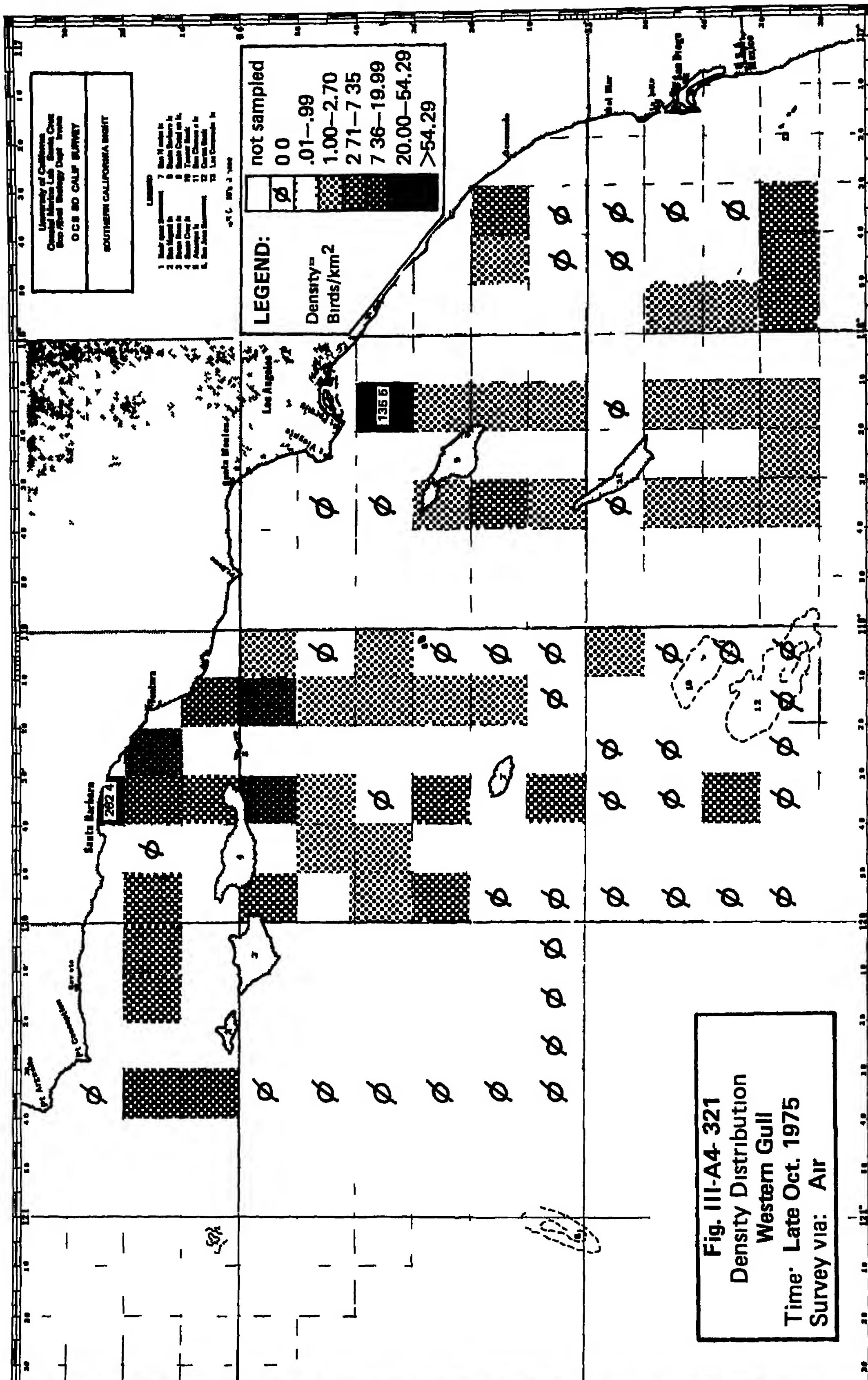


Fig. III-A4- 321
Density Distribution
Western Gull
Time: Late Oct. 1975
Survey via: Air

quite common south and east of San Clemente Is. It was absent from the waters west of the Santa Rosa-Cortés Ridge and the Tanner-Cortés Banks area.

The large increase in numbers of Western Gulls encountered at sea in October may indicate dispersal of birds from outside the southern California area into the Bight, adding to the ranks of the resident population. Numbers on island and mainland beaches were not markedly different from those found in preceding months, suggesting that if birds did indeed move into southern California at this time, they moved primarily into coastal and nearshore waters rather than onto the beaches.

November 1975. Western Gulls were relatively numerous on southern California beaches, particularly at the Ventura Co. beaches and on Santa Cruz Is. (Table III-125). Except at Border Field S.B., they were scarce everywhere south and east of Pt. Mugu. Moderate densities were found throughout the inshore waters of the Bight during a mid-month cruise (Table III-A4-178, Fig. III-A4-322). Observations along the Santa Rosa-Cortés Ridge were hampered by rough weather, so the distribution in offshore waters is not known. Large concentrations, along with numerous Brown Pelicans, California Gulls, and Pomarine Jaegers, were found south of Santa Barbara Is. These mixed-species flocks were associated with feeding California sea lions. Birds were evenly distributed in moderate densities east and southeast of San Clemente Is.

December 1975. We counted fewer Western Gulls on mainland and Santa Cruz Is. beaches than in the previous month (Table III-125). The highest counts for the year were recorded at Border Field S.B. and the count at McGrath S.B. was the lowest for the year. Censuses at Orange Co. beaches continued

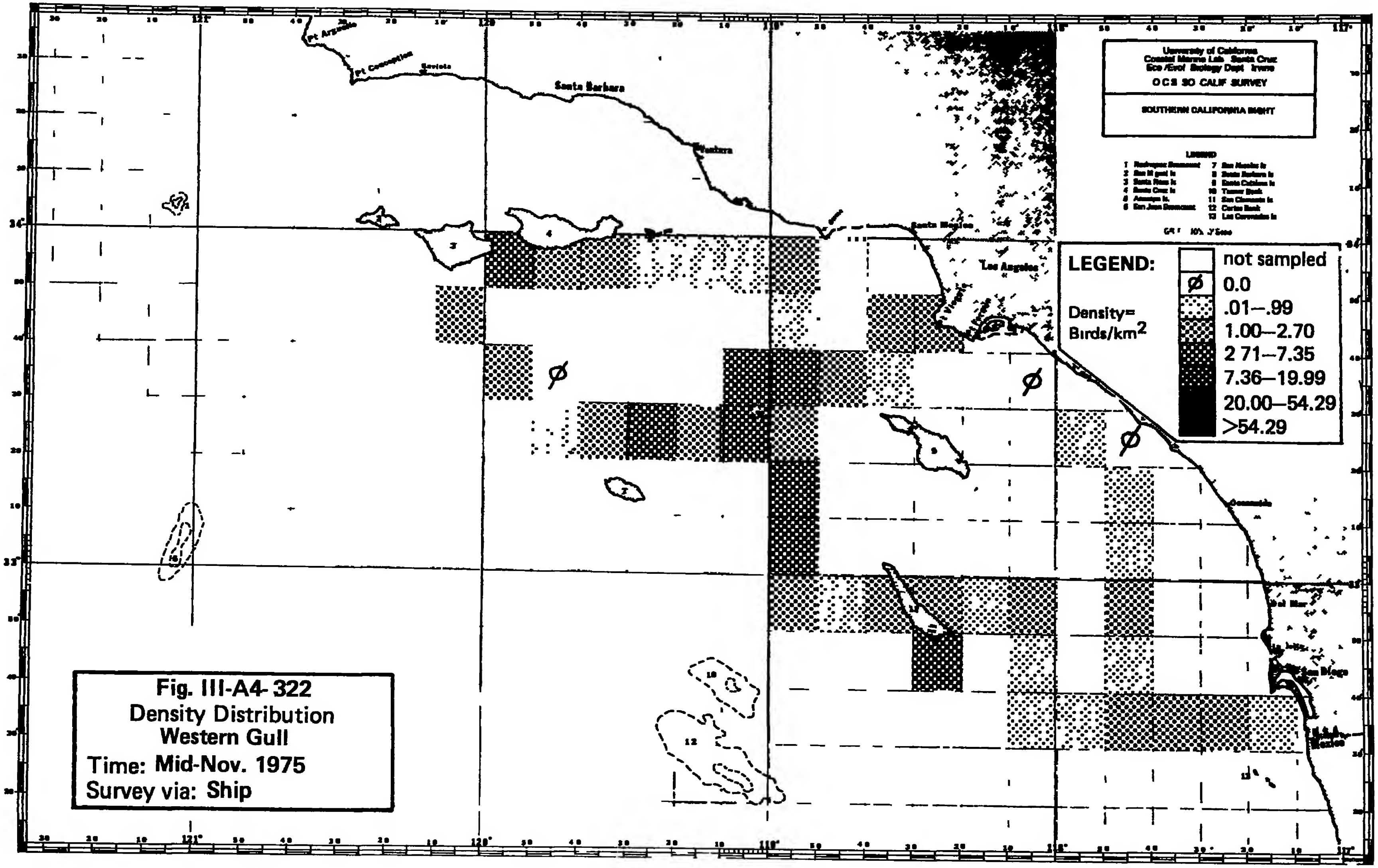


Fig. III-A4-322
Density Distribution
Western Gull
Time: Mid-Nov. 1975
Survey via: Ship

Western Gull (continued)

to yield few sightings.

Surface and aerial surveys were conducted concurrently in mid-month. The area east of Santa Rosa Is. and north of Santa Barbara Is., including Santa Monica Bay, had scattered large groups of Western Gulls; overall density in the area was moderately high (Figs. III-A4-323, 324). The species was abundant along the northern Santa Rosa-Cortés Ridge, but scattered and scarce near Tanner and Cortés Banks. It was not as numerous east of San Clemente Is. as in November. Overall density at sea was lower than in the preceding month.

January 1976. Shipboard observers encountered Western Gulls in low to moderate densities throughout the study area early in the month (Fig. III-A4-325). The Santa Rosa-Cortés Ridge (both north and south), the Santa Barbara Is. area, and the San Diego area all harbored fairly large groups of birds.

Flight surveys conducted at the end of the month showed a similar pattern (Fig. III-A4-326). None were seen on two transects far offshore, beyond the Patton Escarpment. Birds were common to very abundant in Santa Barbara Channel near the northern Channel Islands and along the northern half of the Santa Rosa-Cortes Ridge. The Santa Barbara Island area had high densities but the Tanner-Cortés Banks area was empty. As was the case three weeks earlier, many were found east of Santa Catalina and San Clemente islands.

Beach walks in mid-month and aerial reconnaissance of the islands in late January revealed many hundreds of Western Gulls ashore on Santa Rosa, San Nicolas, Santa Catalina, and San Clemente islands. While the species was still quite scarce on Los Angeles and Orange Co. beaches,

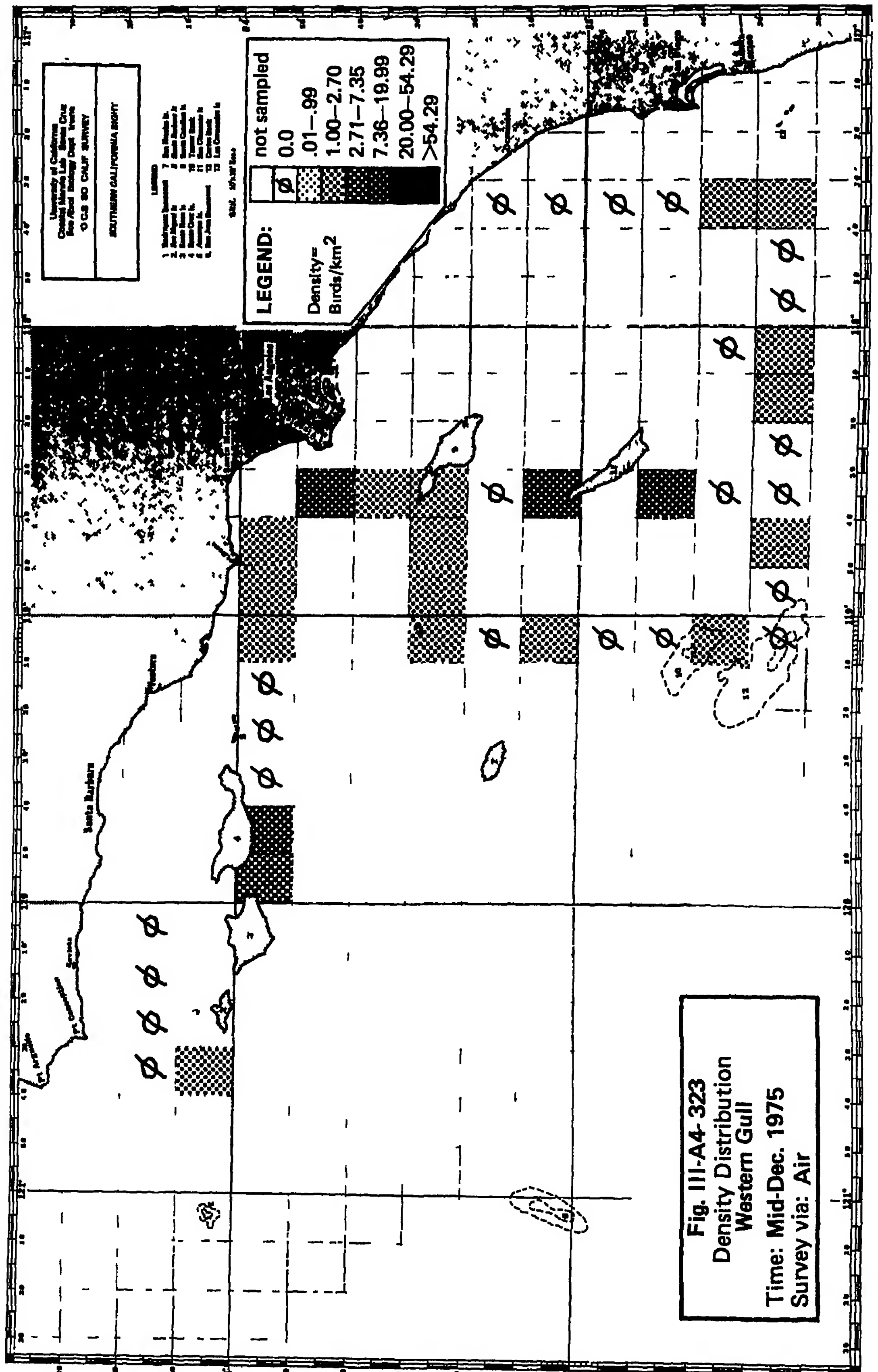


Fig. III-A4-323
Density Distribution
Western Gull
Time: Mid-Dec. 1975
Survey via: Air

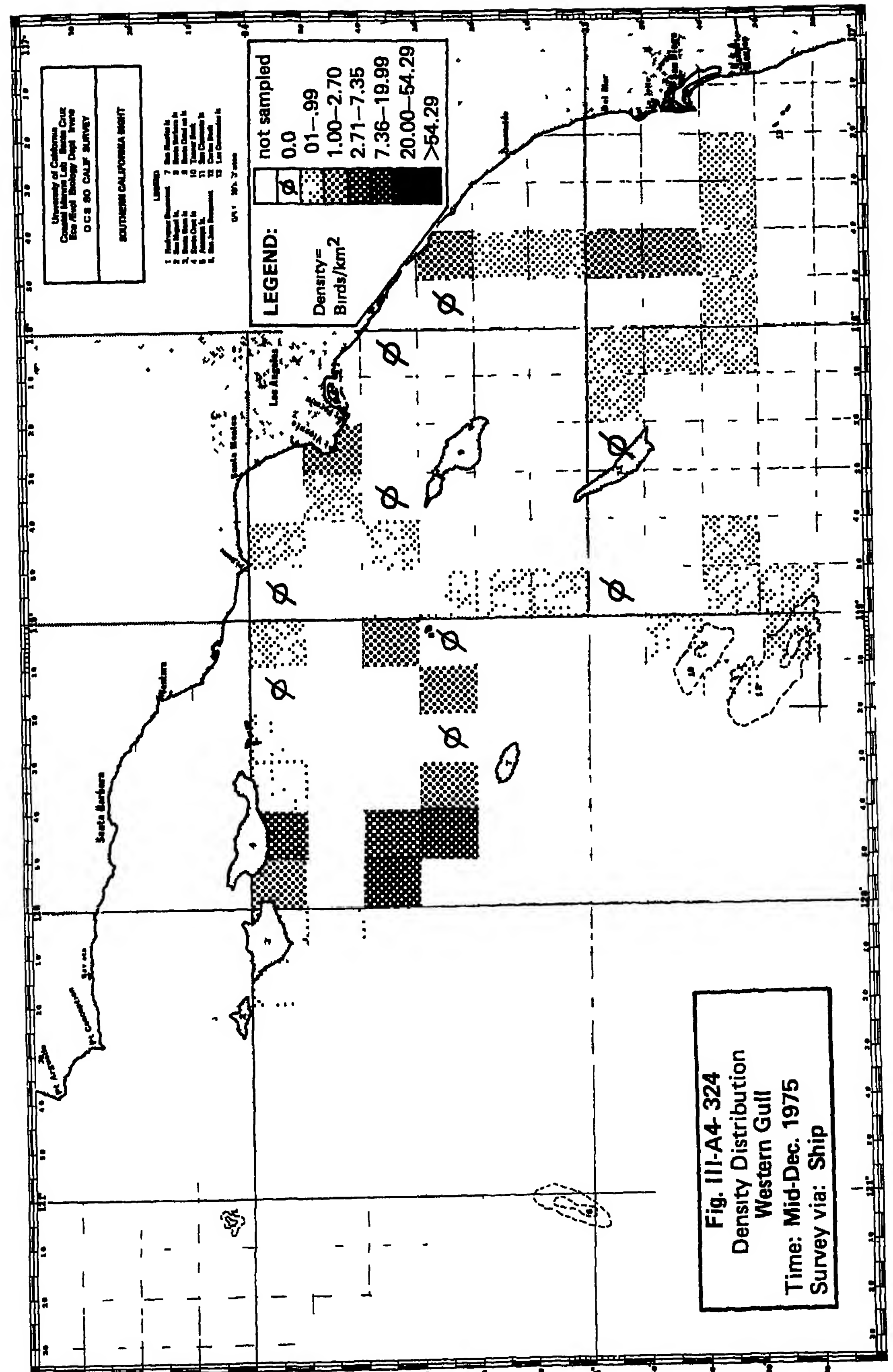


Fig. III-A4-324
Density Distribution
Western Gull
Time: Mid-Dec. 1975
Survey via: Ship

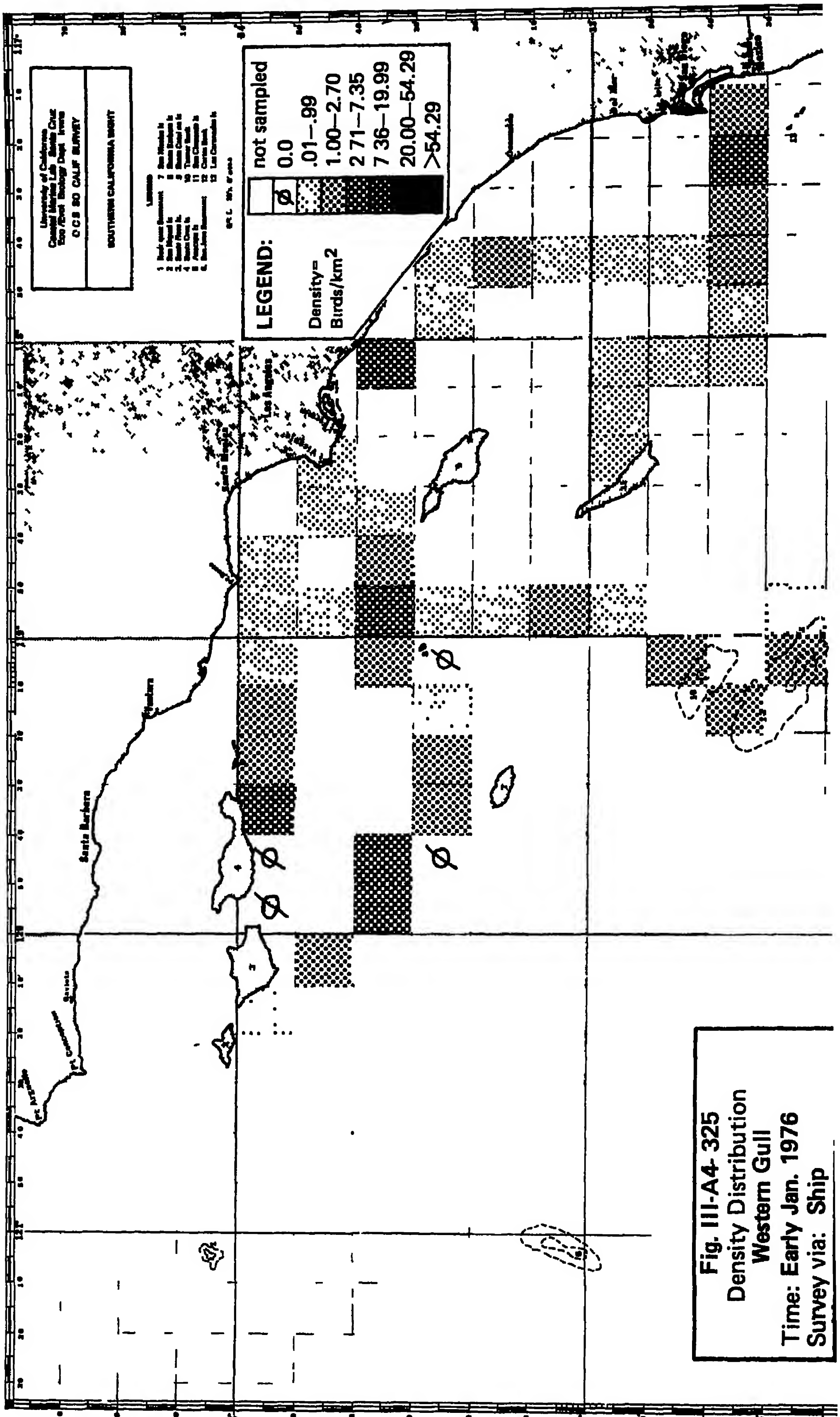


Fig. III-A4- 325
Density Distribution
Western Gull
Time: Early Jan. 1976
Survey via: Ship

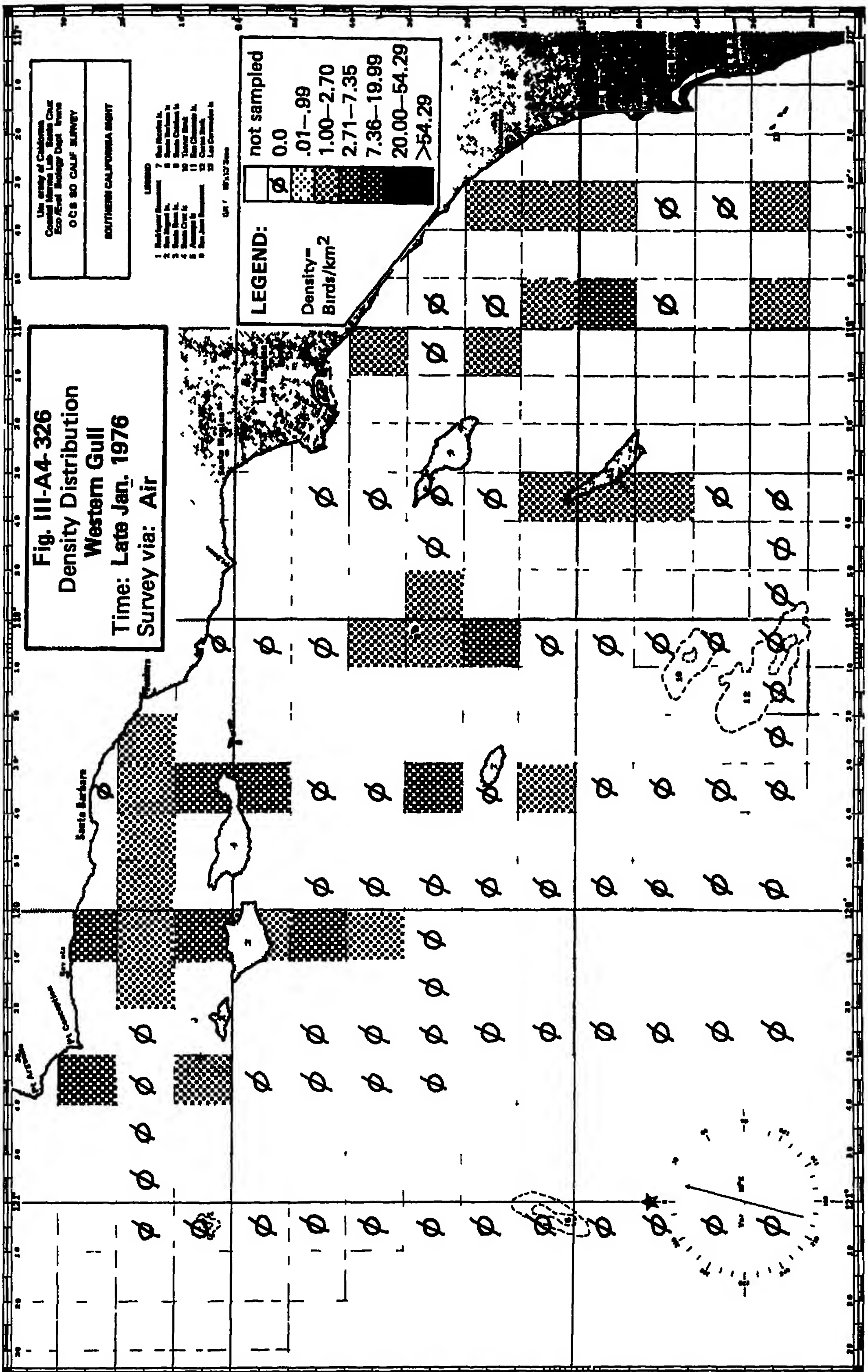


Fig. III-A4-326
Density Distribution
Western Gull
Time: Late Jan. 1976
Survey via: Air
LEGEND:
Density=
Birds/km^2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Santa Barbara
Los Angeles

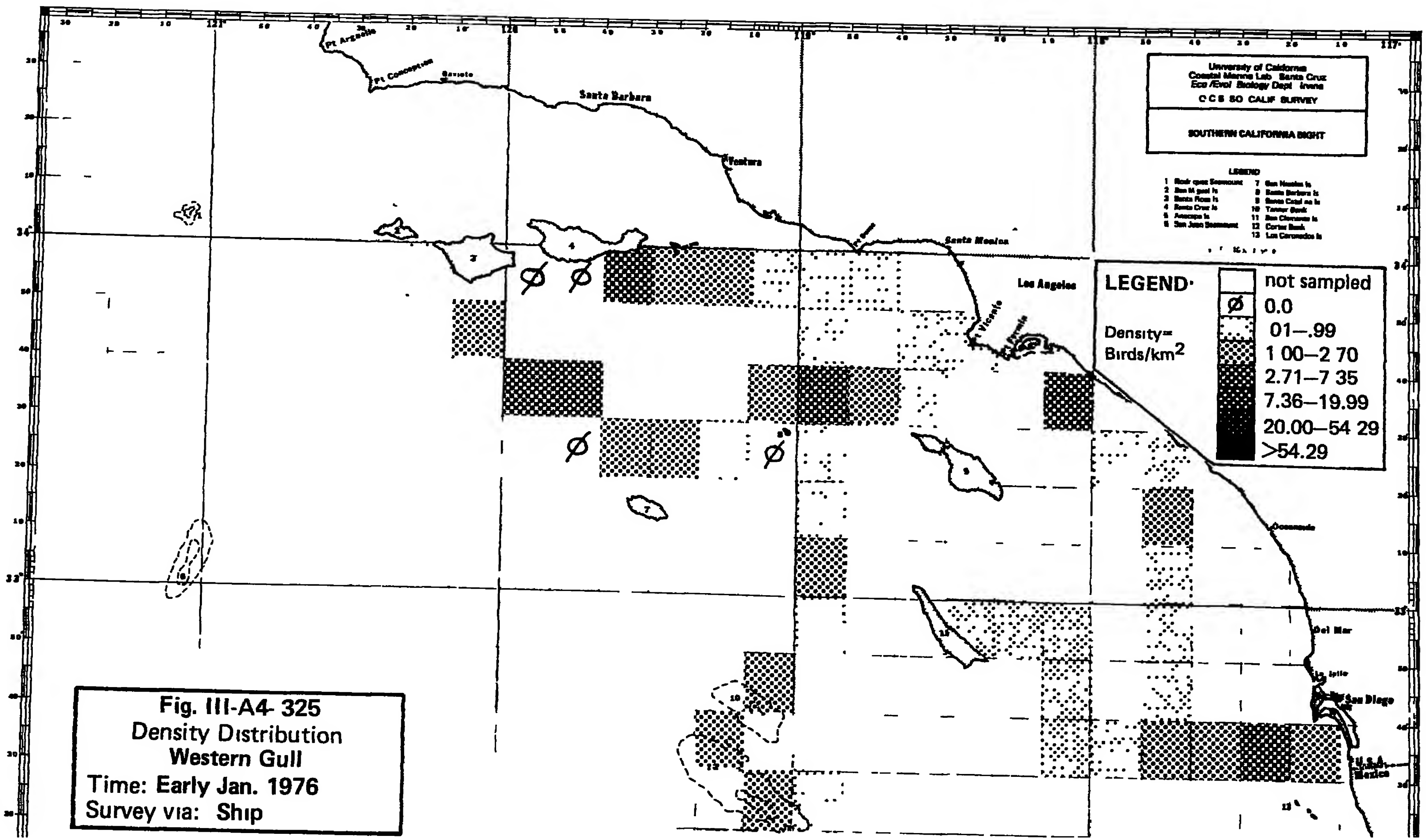


Fig. III-A4- 325
Density Distribution
Western Gull
Time: Early Jan. 1976
Survey via: Ship

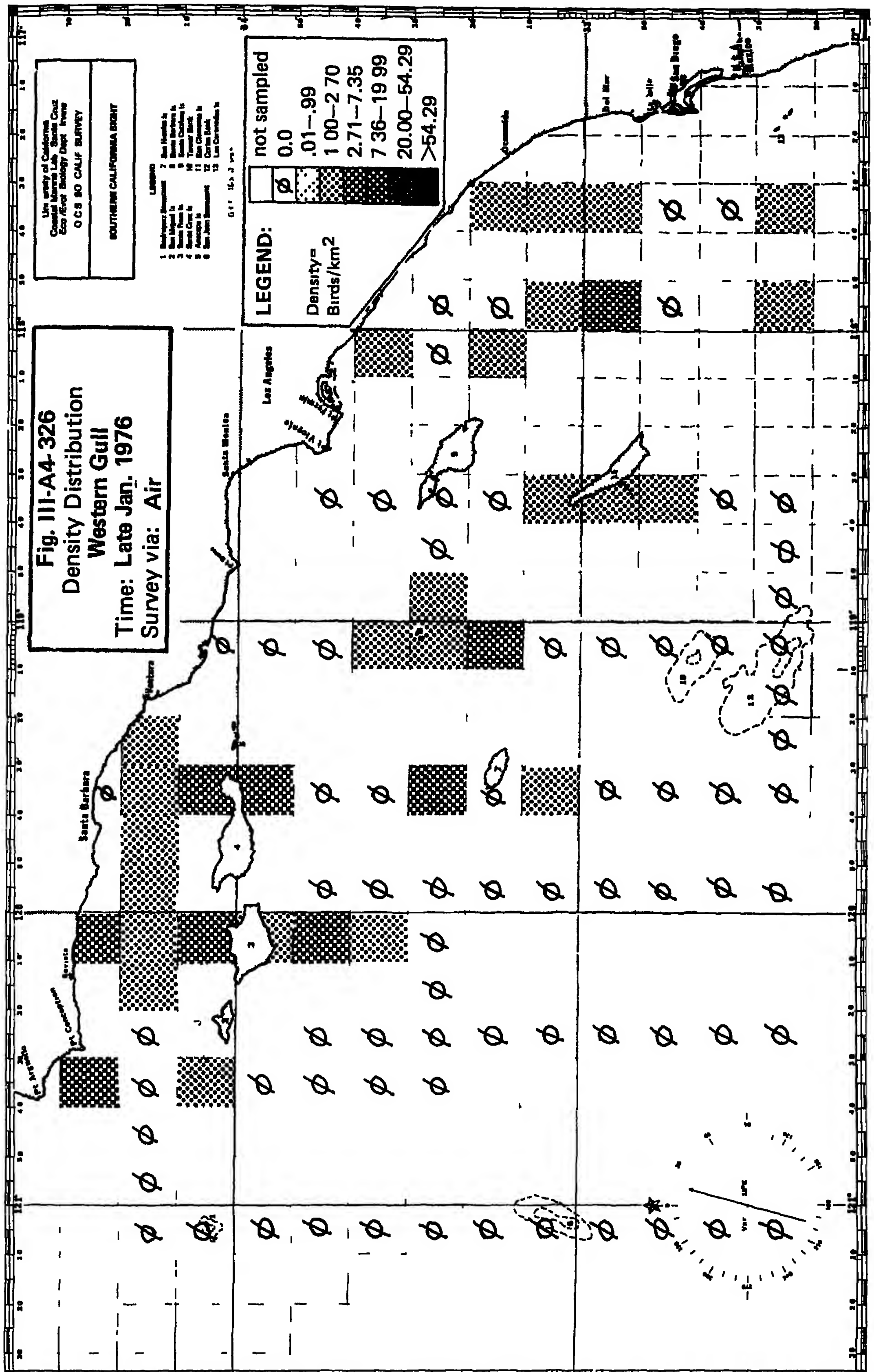


Fig. III-A4-326
Density Distribution
Western Gull
Time: Late Jan. 1976
Survey via: Air
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
SOUTHERN CALIFORNIA BIGHT
Santa Barbara
Santa Monica
Los Angeles
San Diego

it was fairly abundant in the north and south. The total number seen on beaches was fairly high.

Apparently the species was concentrated in the northern islands - Santa Barbara Channel area, in the central and eastern islands area, and near San Diego. Relatively few birds were present inshore of Santa Catalina from Pt. Dume south through Orange Co., including San Pedro Channel. The Tanner-Cortés Banks area had many birds early in January but none later in the month.

February 1976. Numbers of Western Gulls on mainland beaches dropped considerably, counts at McGrath S.B. being particularly low (Table III-125). Los Angeles and Orange Co. beaches harbored their usual low numbers of birds. Incomplete ship surveys among the northern isalnds in mid-month showed Western Gulls were particularly abundant at Anacapa, San Miguel, and Santa Catalina Islands (Table III-A4-178). The latter area was the scene of a massing of many avian and cetacean predators exploiting local concentrations of spawning squid (*Loligo* sp.).

At sea, they were numerous everywhere except east of Santa Catalina and San Clemente Islands. Large groups were found along all the margins of Santa Cruz Basin and near Cortés Bank (Fig. III-A4-327).

March 1976. Beach censuses conducted from the 11th through the 22nd yielded the highest total counts of the year (Table III-125). This was almost exclusively a function of the tremendous concentration found at McGrath S.B., where over 2,300 individuals were found. Beaches south and east of Pt. Mugu yielded few records. Many hundreds were also found on Santa Rosa Is., and the total numbers at San Miguel Is. increased slightly, shifting toward the eastern end where the large Prince Is.

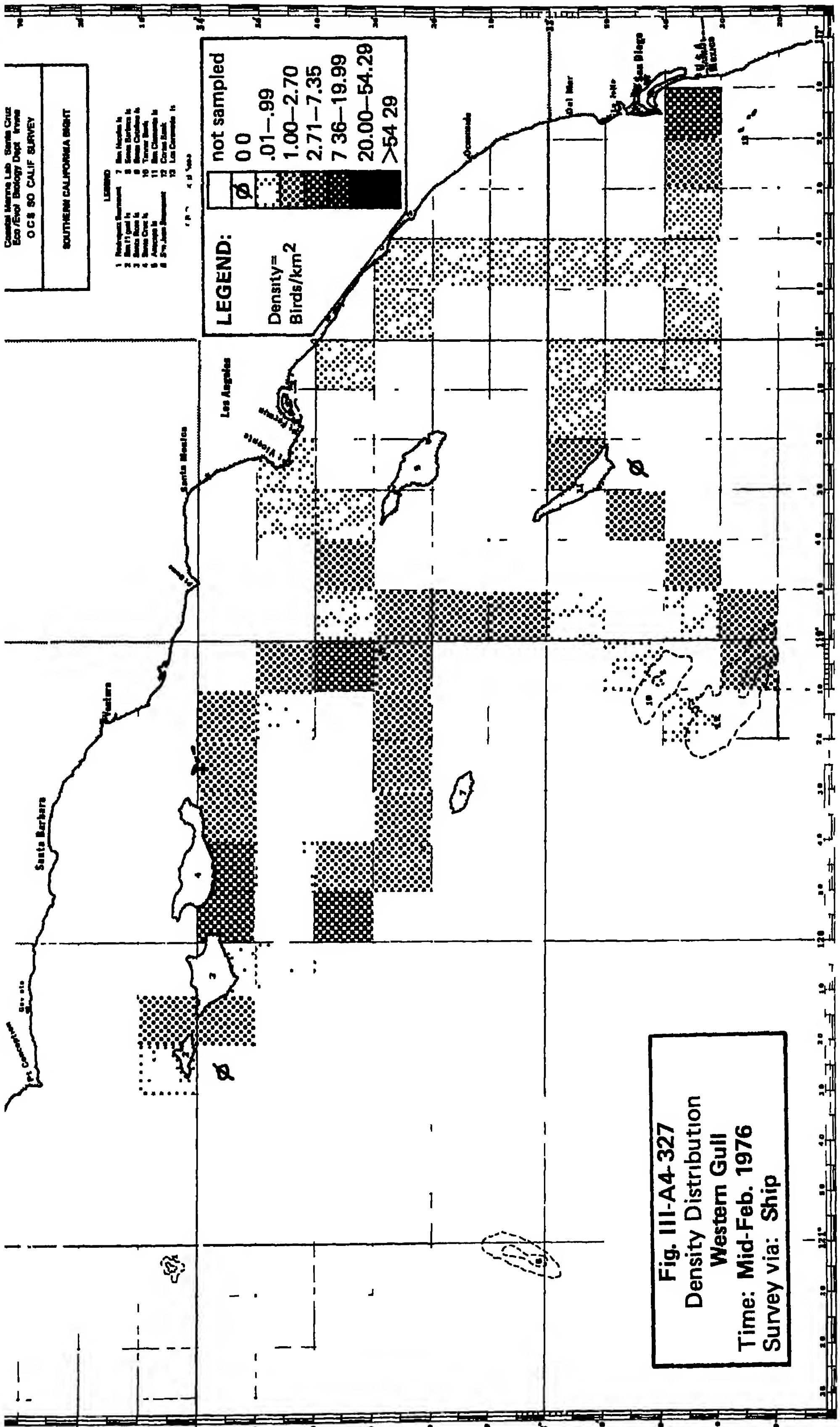


Fig. III-A4-327
Density Distribution
Western Gull
Time: Mid-Feb. 1976
Survey via: Ship

nesting colony is located (Table III-A4-178). Numbers at San Nicolas Is. dropped considerably from the late January counts.

Aerial surveys in mid-March revealed heavy concentrations of Western Gulls near the northern Channel Islands and in the eastern half of Santa Barbara Channel (Fig. III-A4-328). A large, mixed-species flock in which Western Gulls were seen feeding (with Common Murres, Pomarine Jaegers, Heermann's and California Gulls, Brown Pelicans, Arctic Loons, and unidentified cormorants) was photographed approximately 20 km south of the city of Santa Barbara. The species was generally absent in the offshore western waters, except 40 km west of San Nicolas Is. and was all but absent from near Cortés Bank. Although sampling was incomplete east of 118°30'W, it was clear they were present there in fairly large numbers.

Herring Gull (*Larus argentatus*)

The reproductive behavior and ecology of the Herring Gull have received a great deal of attention and study. As a consequence, more is known of its life history than that of most other seabird species. In North America, Herring Gulls nest along lakes and rivers throughout southern coastal and interior Alaska, across vast areas of Canadian prairie and pothole coutry east of the Rocky Mountains, and through the eastern Canadian Arctic, the Maritime Provinces, and coastal New England (A.O.U. 1957; Godfrey 1966; Vermeer 1973; Brown et al. 1975). The current status of New England and Canadian populations is reviewed in the latter two publications and by Kadlec and Drury (1968).

Herring Gulls that nest in Alaska have not been studied extensively. Gabrielson and Lincoln (1959) briefly described the plumage and breeding range of Alaskan birds, and Williamson and Peyton (1963) discussed hybridization between this species and the Glaucous-winged Gull in the Cook Inlet region. Moyle (1966) described the feeding habits of Herring Gulls along Alaskan salmon streams. Patten (1975) has recently shown limited Herring/Glaucous-winged Gull hybridization in coastal southeastern Alaska. Undoubtedly, most of the Alaskan birds winter on the Pacific Coast; it is unclear, however, to what extent birds from interior North America do so.

Herring Gulls winter in large numbers in bays and coastal sites in central California, arriving in November and departing by April; their numbers decline south of there, but migration and wintering dates for southern California remain similar (Harrington 1975). Devillers et al. (1971) indicate several hundred, or perhaps thousands, of individuals winter at refuse dumps in the San Diego area.

Herring Gull (continued)

Yocum (1947), Sanger (1973) and Harrington (1975) have analyzed the offshore distribution of Herring Gulls in the eastern North Pacific. Like Glaucous-winged Gulls, individuals of this species appear to move actively offshore out to 750 km or more from the coast. Adults outnumber immature birds offshore, particularly off California. Sanger (1973) found that adult *L. argentatus* outnumbered immatures by about 4:1 off central California; total numbers decreased with distance from the coast. Harrington (1975) reported that adults declined in abundance from north to south in the P.O.B.S.P. Eastern Grid , but immature Herring Gulls were distributed rather evenly with latitude. He further reported while the species was sometimes common out to 740 km from the southern California coast, numbers were higher closer to shore than far at sea but decreased markedly within 46 km of the mainland.

Mortality factors among New England Herring Gull populations have been analyzed in detail (Kadlec 1976), but are unknown for west coast birds.

Herring Gulls eat a variety of vertebrate and invertebrate foods and also take fish offal, garbage, and marine mammal carrion (Bent 1921, Ingolfsson 1967, Hunt 1972, Vermeer 1973).

1975-76 Baseline Data

April 1975. One record, a single adult bird was found at Pt. Mugu S.B. on the 13th.

May - August 1975. None recorded.

September 1975. A single immature bird was seen at P.M.T.C., Pt. Mugu on the 16th.

Herring Gull (continued)

October 1975. Two birds were found on mainland beaches from the 15th through the 18th (Table III-A4-179). Aerial surveys from the 23rd through 26th revealed 22 Herring Gulls along the southeast side of San Nicolas Is. The species was not encountered at sea.

November 1975. Observers on a standard ship transect cruise in mid-month recorded none at sea. Numbers on mainland beaches began to increase, however, with 18 seen at McGrath S.B. on the 7th (Table III-A4-179).

December 1975. One hundred and thirty-two Herring Gulls were found on southern California beaches in December, indicating a rapid upswing in total numbers over the previous month. Two were counted at sea in mid-month: one was sighted from ship 10 km south of Pt. Dume; the other from the air at the south end of Santa Cruz Channel.

January 1976. Herring Gulls reached their maximum numbers ashore (Table III-A4-179). Sightings on the Channel Islnads were from San Miguel and San Nicolas Islands on the 6th, and San Miguel, Santa Rosa, Santa Cruz, and San Clemente Islands from the 21st through the 24th (Table III-A4-180).

Aerial observers found them scattered in small groups from San Miguel and Santa Rosa Islands south along the northern Santa Rosa-Cortés Ridge (Fig. III-A4-329). A few birds were recorded at other widely-separated locations, including the vicinity of San Juan Seamount, west of Cortés Bank, and southwest of San Diego. They were clearly concentrated in the northwestern third of the study area. Shipboard observers also noted small numbers north and west of Pt. Bennett, San Miguel Is. in Santa Cruz Channel, 15 km north of San Nicolas Is. and 40 and 45 km west of Los Coronados.

Table III-A4-179. Frequency of sightings of Herring Gulls (total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	0	0	0	0	-	1	-	-	0	-	0	0	1
11-24 May		None	recorded.		-								
13-19 June		None	recorded.		-								
11-18 July		None	recorded.										
1-7 August		None	recorded.										
11-18 September	0	0	0	0	1	0	0	0	0	0	-	-	1
15-18 October	0	0	0	1	1	0	0	0	0	0	-	-	2
6-14 November	0	0	0	18	3	0	0	0	1	0	0	2	24
4-11 December	0	0	0	26	3	0	8	0	0	0	0	95	132
11-18 January, 1976	0	4	10	2	16	0	1	0	10	0	3	202	248
16-24 February	2	3	0	10	18	1	1	0	10	4	17	40	98
11-22 March	1	23	1	0	3	5	8	0	0	0	0	12	50

Table III-A4-180.

Frequency of sightings of Herring Gulls (total individuals)on and near Channel Island beaches, April 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Location Date→ Type→	22-25 Jan 76 Air	11-14 Feb 76 Ship	13-15 Mar 76 Air						
SAN MIGUEL IS.									
Richardson Rk. (103)	0	-	0						
West (102,110-20,160,170)	96	2	113						
South (146-51)	0	0	0						
East (101,140-45)	0	0	0						
North (121-40)	0	0	0						
SANTA ROSA IS.									
West (611-12,625)	0	-	0						
South (620-24)	7	4	195						
East (618-19,629)	5	-	0						
North (610,613-17)	0	-	0						
SANTA CRUZ IS.									
West (641,658)	0	-	0						
South (650,653-56)	25	1	-						
East (649,651)	0	-	-						
North (640,643-48)	0	-	0						
ANACAPA IS. (660-80)	-	0	-						
SAN NICOLAS IS.									
Northwest (210-60)	0	-	40						
Southwest (203)	0	-	0						
Southeast (202)	0	-	0						
Northeast (201)	0	-	0						
SANTA BARBARA IS.(300-330)	0	0	0						
SANTA CATALINA IS.									
Northwest (506-07,515, 525-27)	0	0	-						
Southwest (503-05,529)	0	-	-						
South (502,523-24)	0	-	-						
East (501,509-11)	0	0	-						
Isthmus (508,521-522)	0	0	-						
SAN CLEMENTE IS.									
Northwest (409-11)	25	-	25						
West Central (406-08)	0	-	0						
Southwest 404-05)	0	-	0						
Pyramid Cove (402-03)	-	-	0						
East 401,412)	-	-	-						

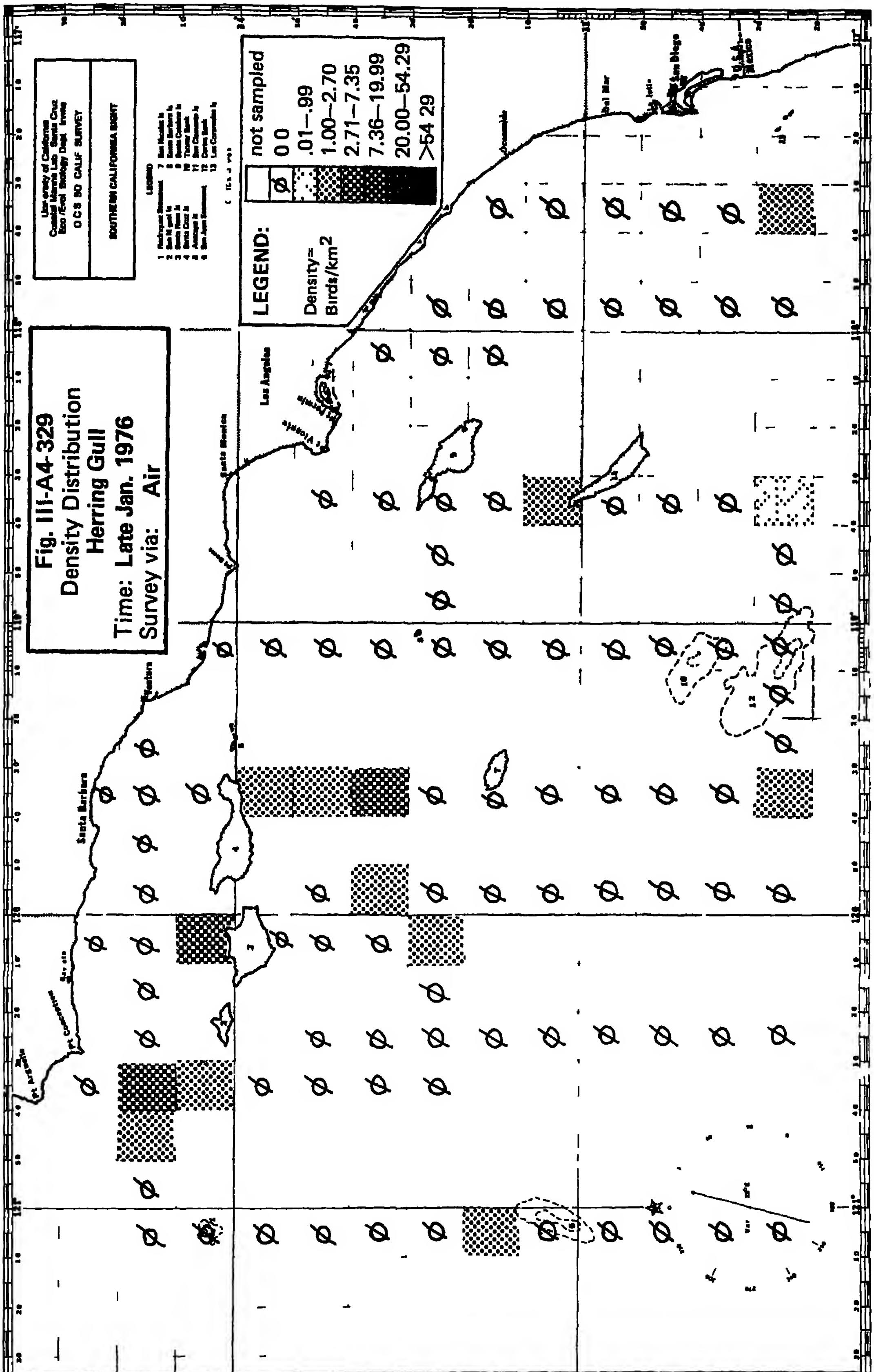


Fig. III-A4-329
Density Distribution
Herring Gull
Time: Late Jan. 1976
Survey via: Air

Herring Gull (continued)

February 1976. Numbers of Herring Gulls on mainland beaches were about two-thirds lower than at the peak a month earlier (Table III-A4-179). Much of this decline was due to the sharp decrease of birds at Border Field S.B. They were widely scattered at sea in low to moderate numbers (Fig. III-A4-330) but with clear centers of concentration near the northern islands and Santa Cruz Basin and west to northwest of San Diego.

March 1976. Aerial surveys in mid-March revealed scattered, single birds as follows: one each, 20 and 30 km east-southeast of Pt. Concepcion and 42 km west of San Nicolas Is.; two 40 km west of San Clemente Is.; one each 75 km northeast and 11 km east of Bishop Rk., Cortés Bank. Shipboard observers also found single birds 20 and 11 km north of Prince Is.; seven near Gull Is.; two in Anacapa Passage, and five at distances out to 18 km north and south of Santa Barbara Is. They were obviously widely scattered and uncommon west of 118°30'W, but absent east of there. Aerial surveys and beach counts in mid-March combined to show these birds were present throughout the islands and on the mainland, but for the most part in smaller numbers than in the two preceding months (Tables III-A4-179 and -180). Particularly large groups were found at San Miguel and Santa Rosa Islands.

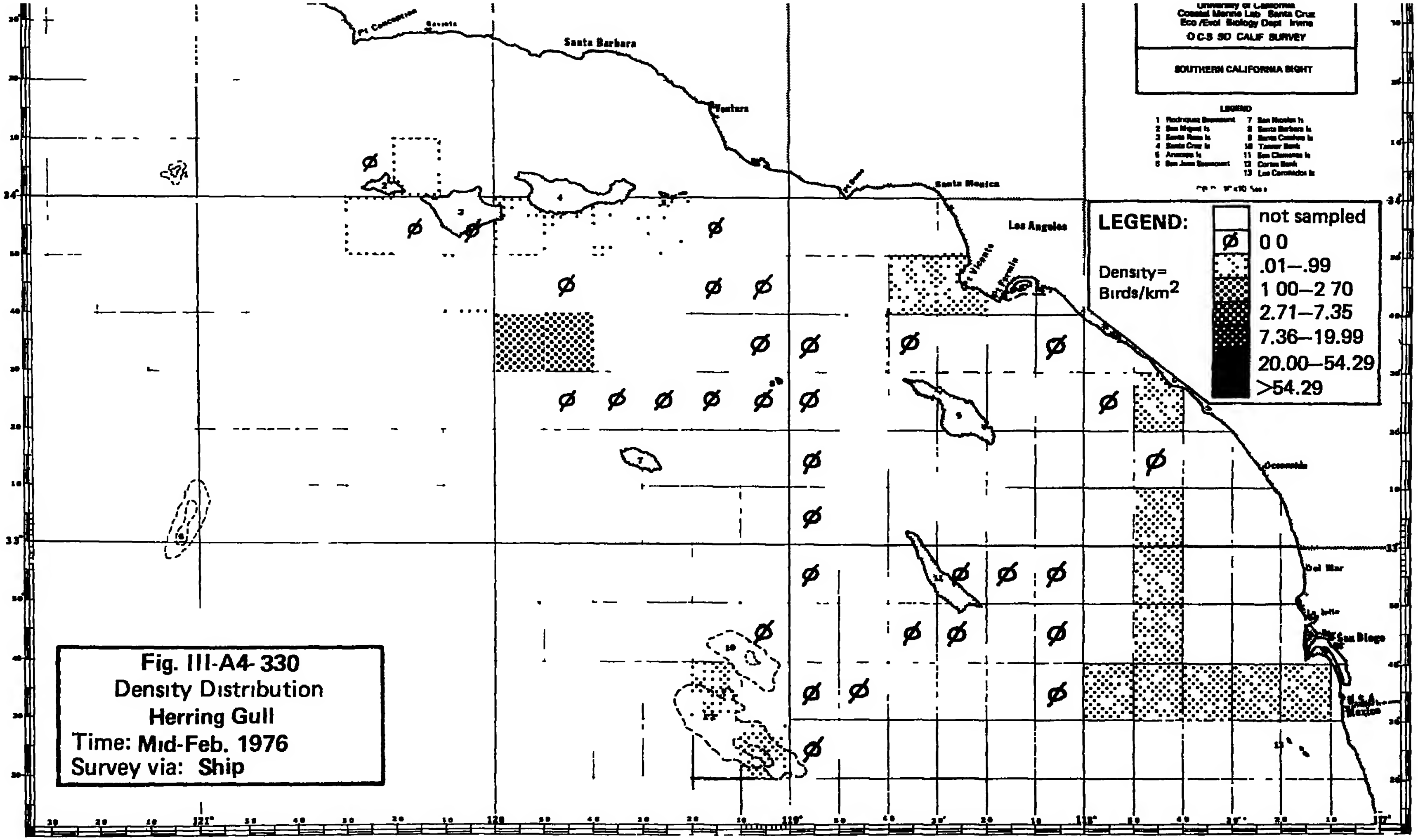


Fig. III-A4-330
Density Distribution
Herring Gull
Time: Mid-Feb. 1976
Survey via: Ship

Thayer's Gull (*Larus thayeri*)

Until recently considered a subspecies of Herring Gull, this gull was accorded specific rank by Godfrey in 1966 and later by the A.O.U. (1973). Thayer's Gull nests in the eastern Canadian Arctic and Greenland and winters along the Pacific coast from British Columbia to Baja California (Devillers et al. 1971). Early authors recorded Thayer's at a number of California locations, including coastal southern California (Grinnell and Miller 1944), but early sightings and even some specimen records may not have been valid. More recently, Devillers et al. (1971) have recorded 100-150 wintering in the San Diego area each year, and sight records at sea are beginning to turn up (Sanger 1973).

These birds usually appear at San Diego in November, peak in number in January and February, and depart by the end of April. They typically arrive in San Diego later in autumn than do Herring Gulls with which they associate (McCaskie 1969, Devillers et al. 1971). The latter authors state that older immatures arrive earlier than juveniles, and these before adults.

Other than an adult sighted 37 km off extreme northwestern California (Sanger 1973), we know of no published records of the species offshore of California, though there are several unpublished records. Nothing is known of the feeding habits of Thayer's Gulls while on their wintering grounds.

1975-76 Baseline Data

Four records, see Volume III, p.III-607.

California Gull (*Larus californicus*)

The California Gull nests on inland marshes, lake margins, and stream courses in interior North America, including the plateau region of northeastern California. Birds frequently stray as high as 3,000 m in elevation in the Sierra Nevada while foraging or passing between nesting grounds and the coast. This species is one of the most abundant winter residents along the coast, visiting the broadest range of habitats of any gull in our area (Grinnell and Miller 1944, Small 1974). At coastal sites in southern California, numbers of California Gulls peak from September through February, and some birds remain through summer each year. This species often outnumbers all other gulls in southern California Christmas bird counts.

This species may be found quite some distance at sea, though not as far out as its pelagic relatives, the Black-legged Kittiwake and Sabine's Gull. Sanger (1973) reported that adult California Gulls were infrequently seen within 46 km of the mainland coast off central California. He did not indicate if the species was encountered at greater distances from shore. Harrington (1975) reported them to be numerous inshore of the Channel Islands, decreasing in abundance with distance from shore. Birds have been sighted as far off as 167 km southwest of San Clemente Is., but did not reach the eastern edge of the P.O.B.S.P. Eastern Grid (another 90 km seaward). They regularly reach the Channel Islands (Howell 1917, Harrington 1975).

The food habits of the species at inland nesting stations have been discussed by Bent (1921), Greenhalgh (1952), and Vermeer (1970). Prey items include insects, small fish, crayfish, small mammals, garbage and carrion. On the coastal wintering ground most of the same items are

probably taken, perhaps with a shift toward squid, schooling fishes, and crustaceans.

1975-76 Baseline Data

April 1975. These gulls were recorded only on the south side of Santa Cruz Is. (five birds, Table III-123).

May 1975. Low to high densities were recorded between Santa Catalina Is. and the mainland (Fig. III-A4-331). Birds were not found more than 30 km from the coast nor on Santa Cruz, Santa Catalina, or San Clemente Islands, where beaches were censused either on foot or from the air.

June 1975. None recorded at sea during surface and aerial surveys in the last half of the month. About 250 birds, mostly immatures, were counted at mainland beaches (Table III-123). The birds at Huntington S.B. apparently spent the summer there.

July 1975. Beach surveys in mid-month (Table III-123) revealed about the same number as in June. None were detected on Santa Cruz Is. From the 21st through the 26th, only four birds were counted at sea. Two were sighted about 5 km west of Pt. Vicente, and two were seen 15 km south of Los Angeles Harbor. Clearly, most of the summer residents were to be found in the area from Los Angeles to Huntington Beach.

August 1975. Numbers on mainland beaches dwindled somewhat (Table III-123), mainly reflecting a drop in the count at Huntington S.B. None were found at sea nor on Channel Islands beaches, despite comprehensive surface and aerial sampling.

September 1975. Two California Gulls were found at sea: one, 13 km southwest of San Miguel Passage on the 9th, the other, 18 km west of Pt. Vicente on the 22nd. Numbers on southern California beaches increased

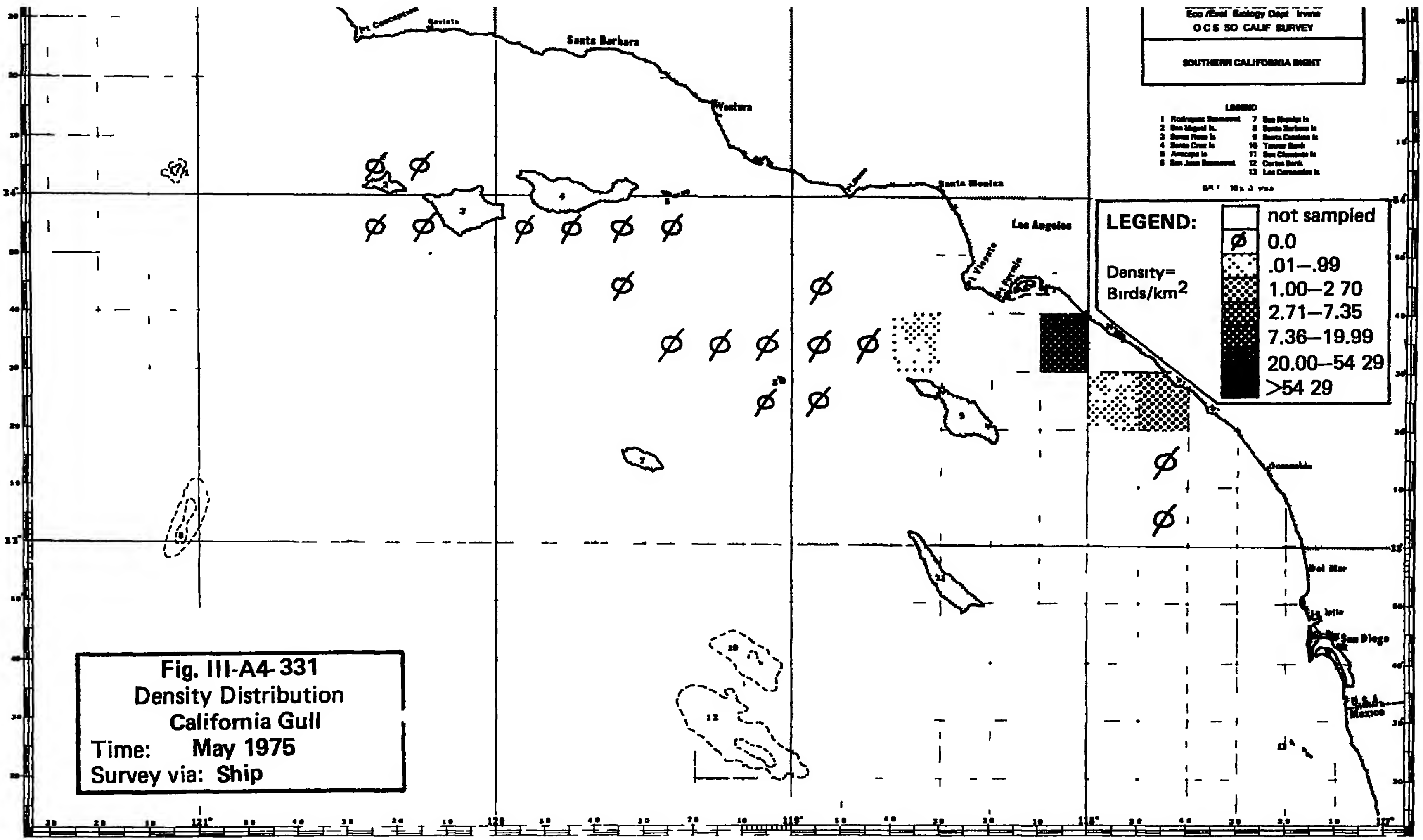


Fig. III-A4-331
Density Distribution
California Gull
Time: May 1975
Survey via: Ship

somewhat over the previous month. Once again, the great majority of onshore sightings were from Huntington S.B. and Dockweiler S.B. (Table III-123).

October 1975. Slightly fewer birds were counted on mainland beaches than in the previous month; concentrations were again noted at Los Angeles and Orange Co. beaches. Aerial surveys mid-month recorded them on Santa Cruz, San Nicolas, and San Clemente Islands (16, 1, and 6 individuals, respectively).

This apparent shift of numbers toward the islands was substantiated by the numerous sightings at sea. High densities were encountered in Santa Barbara Channel, with scattered sightings of small flocks elsewhere (Fig. III-A4-332). In view of the large numbers at sea in November, it is probable that the October records documented the first major influx of wintering birds.

November 1975. California Gulls moved into the study area in large numbers by mid-November. Beach censuses revealed an upswing in total numbers, particularly on northern beaches and Santa Cruz Is. This pattern was quite different from that in the preceding several months (Table III-123).

At sea, California Gulls were common to abundant in the central section of the study area, particularly in Santa Monica Bay and south of Santa Barbara Is. (Fig. III-A4-333). The latter area harbored large, mixed-species feeding flocks associated with California sea lions. Poor observation conditions along the western part of the cruise track may have lowered counts. California Gulls were considerably less common in the southeastern third of the study area than elsewhere.

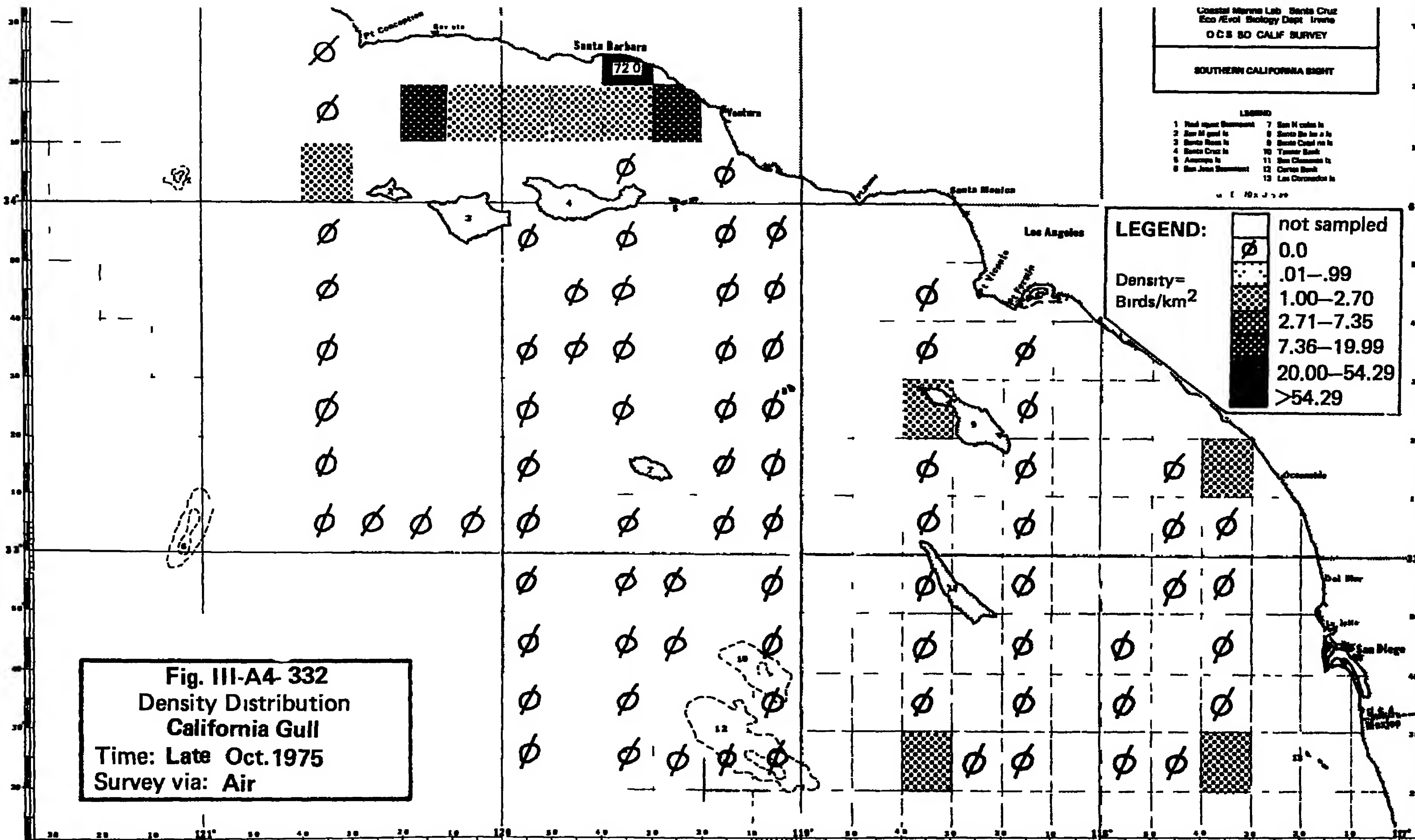


Fig. III-A4-332
Density Distribution
California Gull
Time: Late Oct. 1975
Survey via: Air

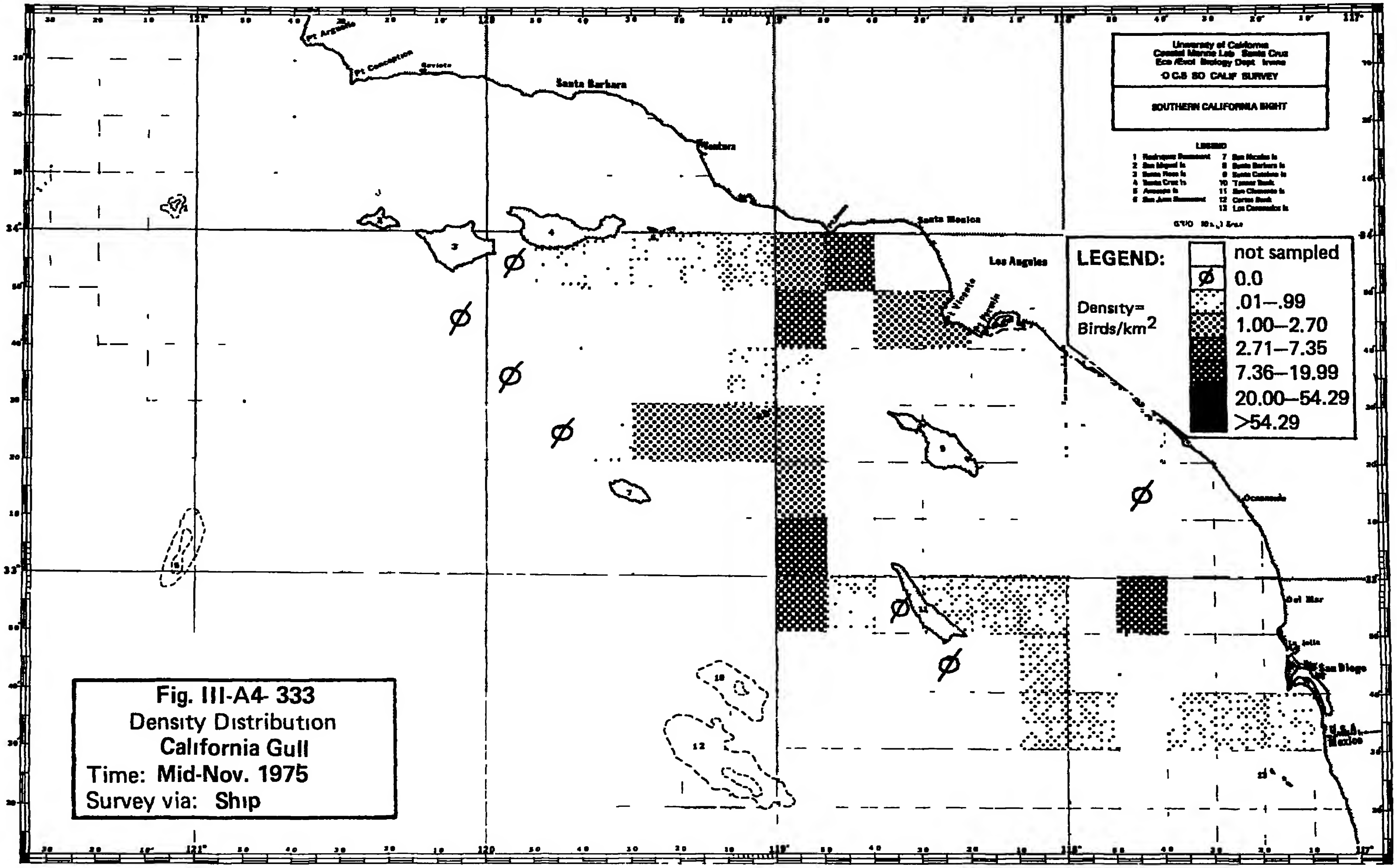


Fig. III-A4- 333
Density Distribution
California Gull
Time: Mid-Nov. 1975
Survey via: Ship

California Gull (continued)

December 1975. Numbers increased on mainland and Santa Cruz Is. beaches (Table III-123). As in November, most were found at northern and Santa Cruz Is. beaches. Several hundred were also found at Border Field S.B., to the south.

Major concentrations were found in Santa Monica Bay in mid-month, but density declined to the west and southeast (Figs. III-A4-334, 335). Large numbers were also recorded from 20-35 km northwest of San Nicolas Is. and close inshore off the Orange Co. coast. Scattered flocks were found near Cortés Bank and throughout the area from San Clemente Is. to the mainland.

January 1976. The total number of California Gulls at sea and on mainland beaches peaked in January. Well over 2,500 birds were found on mainland beaches mid-month, including 2,175 at Border Field S.B. (Table III-123). Table III-A4-181 shows they were found in large numbers at Santa Cruz, Santa Catalina, and San Clemente islands, and in smaller groups elsewhere. Muny hundreds of unidentified gulls were present at San Nicolas, Santa Catalina, and San Clemente islands at the same time. It is likely many of these at the latter two islands were of this species.

Ship surveys early in the month and aerial surveys from the 21st through the 24th showed these birds to be widely distributed at sea. Very high densities were recorded in Santa Barbara Channel, Santa Monica Bay, and on the northern Santa Rosa-Cortés Ridge (Figs. III-A4-336, 337). By extrapolation from the densities given in Fig. III-A4-337, it was calculated no less than 50,000 California Gulls occupied the waters overlying the Santa Rosa-Cortés Ridge between Santa Rosa and San Nicolas islands. Birds were found in lesser numbers elsewhere, with small flocks

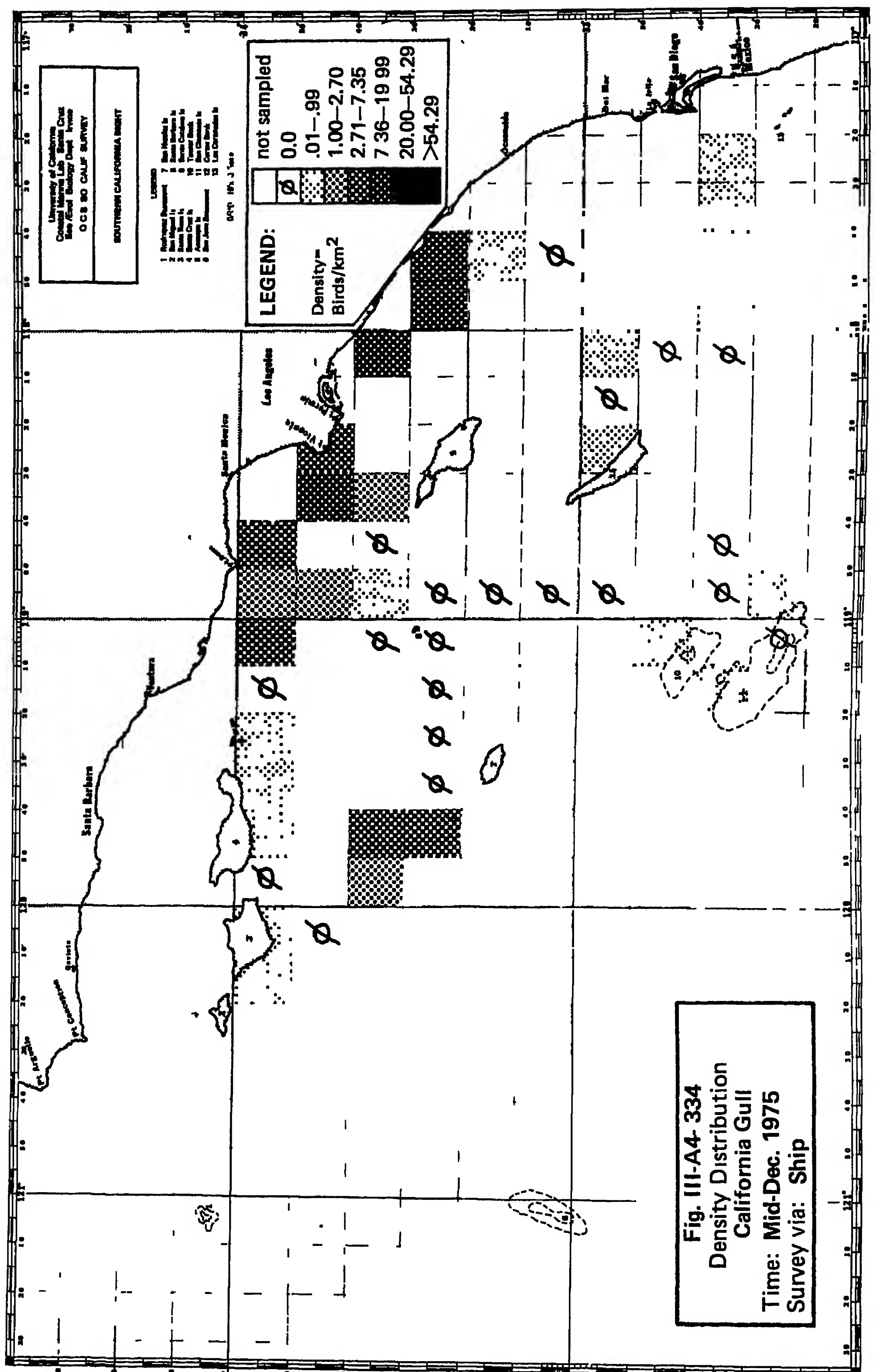


Fig. III-A4-334
Density Distribution
California Gull
Time: Mid-Dec. 1975
Survey via: Ship

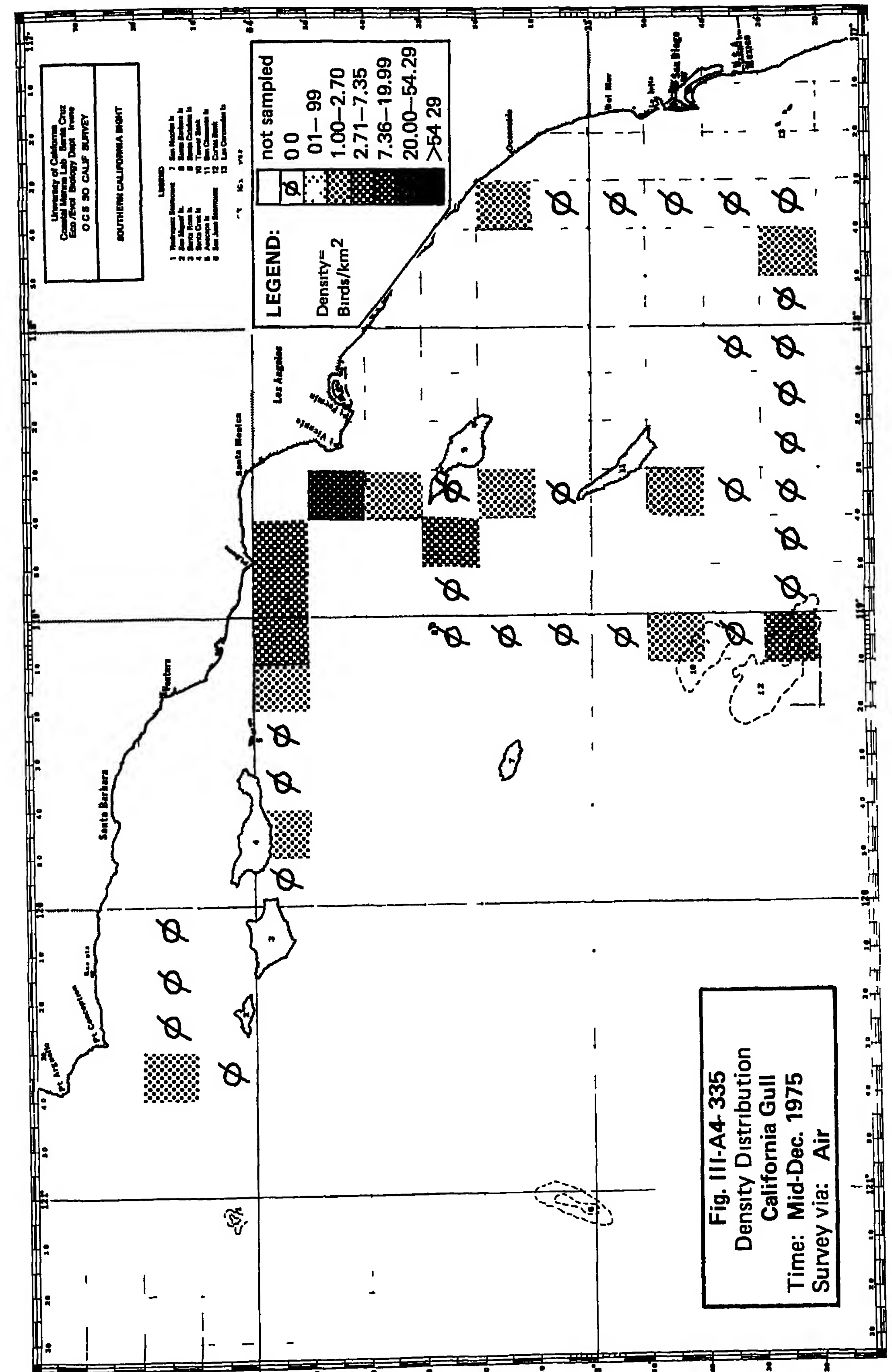


Fig. III-A4-335
Density Distribution
California Gull
Time: Mid-Dec. 1975
Survey via: Air

Table III-A4-181.

Frequency of sightings of California Gulls (total individuals)on and near Channel Island beaches, -- January through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Location / Date→ / Type→	11-15 Jan 76 Ship	23-25 Jan 76 Air	11-14 Feb 76 Ship	12-14 Mar 76 Air
SAN MIGUEL IS.				
Richardson Rk. (103)				
West (102,110-20,160,170)	0	0	1	0
South (146-51)	0	0	4	0
East (101,140-45)	7	0	0	0
North (121-40)	10	0	1	0
SANTA ROSA IS.				
West (611-12,625)	1	9	-	0
South (620-24)	7	50	11	230
East (618-19,629)	0	12	-	81
North (610,613-17)	15	4	-	0
SANTA CRUZ IS.				
West (641,658)		132	-	0
South (650,653-56)	4	71	1	76
East (649,651)	7	0	-	0
North (640,643-48)		30	-	0
ANACAPA IS. (660-80)	-	-	1	-
SAN NICOLAS IS.				
Northwest (210-60)	-	51	-	0
Southwest (203)	-	1	-	0
Southeast (202)	-	9	-	0
Northeast (201)	-	0	-	0
SANTA BARBARA IS.(300-330)	2	4	0	0
SANTA CATALINA IS.				
Northwest (506-07,515, 525-27)	-	8	907	-
Southwest (503-05,529)	-	286	-	-
South (502,523-24)	-	14	-	-
East (501,509-11)	-	131	2308	-
Isthmus (508,521-522)	-	89	430	-
SAN CLEMENTE IS.				
Northwest (409-11)	-	172	-	0
West Central (406-08)	-	21	-	0
Southwest 404-05)	-	100	-	0
Pyramid Cove (402-03)	-	-	-	-
East 401,412)	-	-	-	-

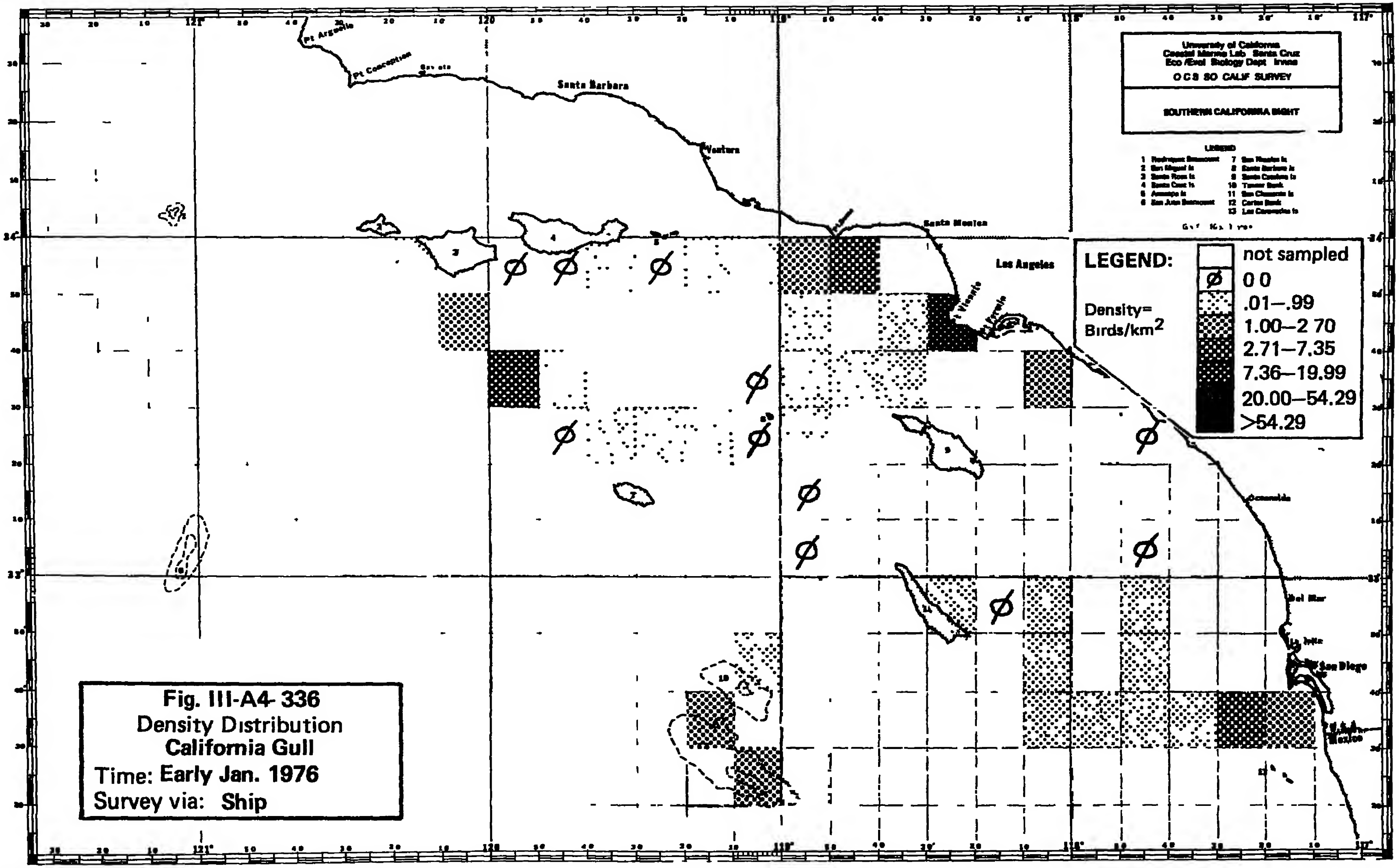


Fig. III-A4- 336
Density Distribution
California Gull
Time: Early Jan. 1976
Survey via: Ship

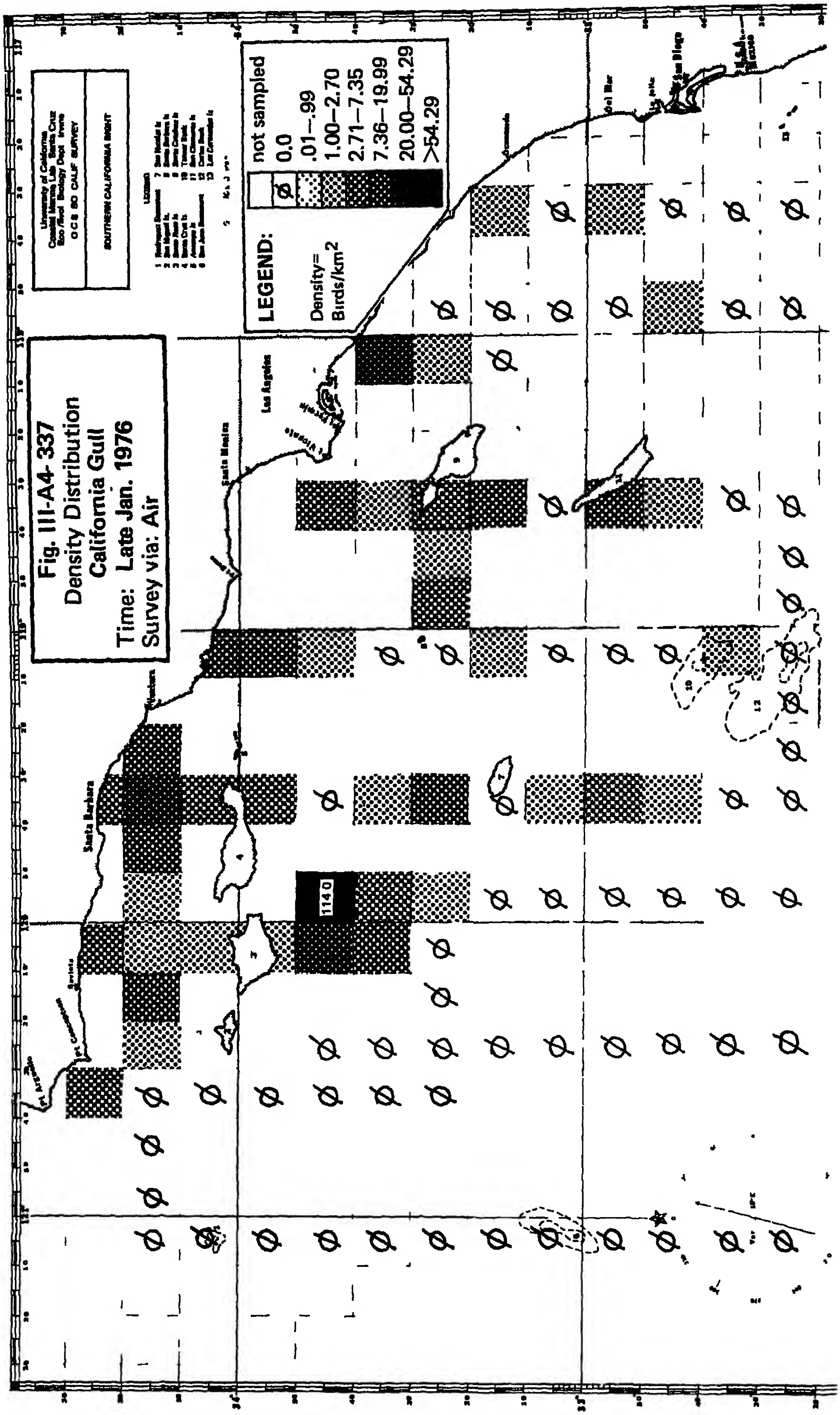


Fig. III-A4-337
Density Distribution
California Gull
Time: Late Jan. 1976
Survey via: Air
LEGEND:
Density=
Birds/km²
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
114.0
Santa Barbara
Ventura
Santa Monica
Los Angeles
San Diego
SOUTHERN CALIFORNIA BIGHT

California Gull (continued)

at Tanner and Cortés Banks, near Santa Catalina and San Clemente islands, and off the Orange Co. coast. None were found seaward of the Santa Rosa-Cortés Ridge.

February 1976. Counts of California Gulls on the mainland beaches dropped greatly, but many hundreds were found on beaches at the west end of Santa Cruz Is. (Table III-123) and along the north and east sides of Santa Catalina Is. (Table III-A4-181). Birds in the latter area were feeding on squid.

Ship surveys at sea indicated decreased abundance near the northern islands and along the Santa Rosa-Cortés Ridge from the very high counts a month earlier (Fig. III-A4-338). The species was virtually absent offshore of Santa Barbara and San Clemente islands and scarce in the Gulf of Santa Catalina.

March 1976. Aerial surveys from the 12th through the 14th revealed that California Gulls were nearly absent from offshore areas, the only sightings being 20 km north of Santa Rosa Is. (one bird), 15 km west of Ventura (one), and 25 km and 40 km southwest of Oceanside (one and three birds, respectively). Ship surveys the following week added records of 20 California Gulls in Anacapa Passage, ten between Anacapa and Santa Barbara islands, and three within a few km of Santa Barbara Is.

Surveys of island and mainland beaches from the 11th to the 22nd (Table III-123, III-A4-181) showed the species was scarce on the mainland and eastern islands, common at Santa Rosa and Santa Cruz islands, and absent from San Miguel and San Nicolas islands.

Taken together, these data indicate both withdrawal from off-shore waters toward the northern islands and Santa Catalina Is., and departure of many birds from mainland census areas.

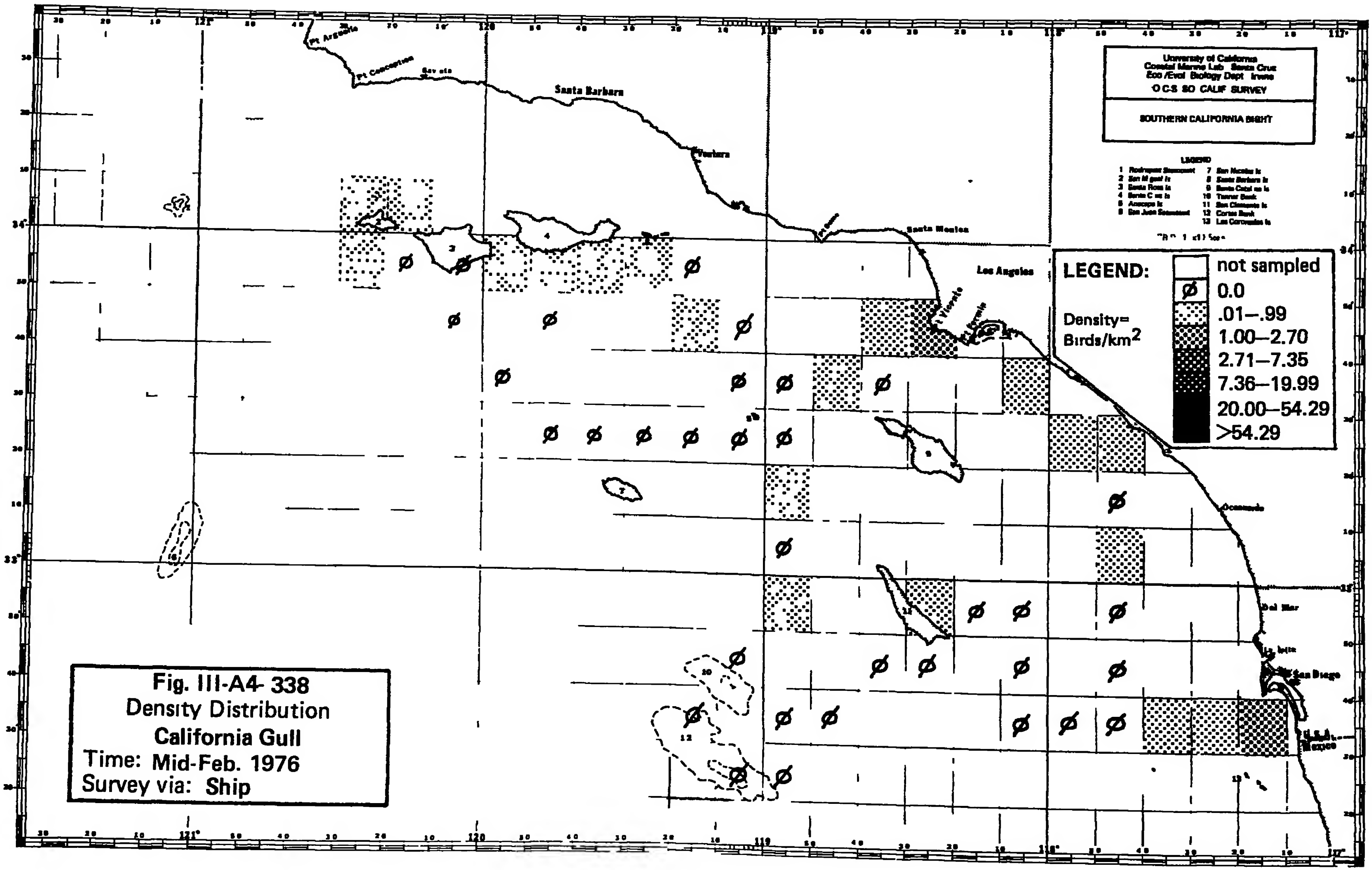


Fig. III-A4- 338
Density Distribution
California Gull
Time: Mid-Feb. 1976
Survey via: Ship

Ring-billed Gull (Larus delawarensis)

Though Ring-billed Gulls nest in small numbers in extreme north-eastern California, the species is known through most of the state as a winter visitor to coastal and inland marshes, beaches, fields, and dumps. Numbers of Ring-billed Gulls wintering along the coast increase southward from San Francisco; the months of peak abundance are August through May (Grinnell and Miller 1944, Small 1974). In southern California they, like Mew and Heermann's Gulls, are abundant near the mainland coast, and rare more than 10 km offshore (Small 1974). There are only four records from the Channel Islands (Jones in prep.). A few individuals (mostly immatures) remain through the summer on beaches and near garbage dumps in southern California, but the great majority heads northeast in spring.

Nesting occurs in a variety of habitats, including seacoasts (Labrador and Prince William Sound, Alaska, for example), freshwater marshes throughout most of Canada north of 50°N, and gravel bars and lake margins in Canada's prairie provinces (Bent 1921, Southern 1974a). Nests are usually constructed on islands or isolated gravel bars.

The migration and dispersal patterns of this species have been well-studied in recent years (Southern 1974a, 1975), and their reproductive behavior and ecology have received a great deal of attention (c.f. Cuthbert and Southern 1973, Detheimer and Southern 1974, Southern 1974b, Miller and Emlen 1975, Ryder 1975).

The foods consumed by Ring-billed Gulls while on the nesting grounds include insects, fishes, other birds' eggs, small mammals, and garbage (Bent 1921), and it is likely that these same items also constitute the winter diet.

Ring-billed Gull (continued)

1975-76 Baseline Data

April 1975. Ring-billed Gulls were scattered on southern California beaches in low numbers (Table III-124).

May 1975. Only two birds recorded, both from Dockweiler S.B.

June 1975. Numbers increased at central and southern beaches (Table III-124). with a high count of 30 birds at Huntington S.B.

July - October 1975. Moderate numbers spent the summer at Dockweiler S.B. and Huntington S.B.; fewer birds were found elsewhere (Table III-124).

November 1975. A rapid upswing in total numbers occurred in late October and early November. From the 6th through the 14th, many hundreds were censused at northern (McGrath S.B. and P.M.T.C., Pt. Mugu) and San Diego area (Silver Strand) beaches. The species was less plentiful at the central beaches (Table III-124).

December 1975 - January 1976. Total counts remained relatively high in these months. The lagoon at Pt. Mugu harbored many hundreds of birds in both months. Our only open-ocean sightings of this species in the entire year occurred on 15 December when two birds were seen 5 and 10 km west of Pt. Vicente, respectively.

Feburary - March 1976. Ring-billed Gulls declined rapidly in abundance in late winter, becoming widely-scattered and scarce by the end of the study year. As in previous months, none were seen offshore or on the islands.

Mew Gull (<u>Larus canus</u>)

Mew Gulls nest near ponds and streams throughout interior Alaska south of the Brooks Range and in the Aleutians, Prince William Sound, and the Juneau area in lesser numbers. The breeding range extends east through the Yukon, British Columbia, and Alberta (Bent 1921, Gabrielson and Lincoln 1959). Adults depart the breeding range from July through September and reach central California by early October. Birds continue to drift southward (in smaller numbers) from Monterey, arriving in southern California waters in November (Bent 1921, Devillers et al. 1971).

Mew Gulls winter in larger numbers in the Santa Barbara area than in San Diego. Devillers et al. (1971) state that only 100 or so birds winter near San Diego, while many times that total have been recorded near Santa Cruz Is. on a single cruise (Jones unpubl. notes). Devillers et al. (1971) also report only three records from Baja California and none from the Sea of Cortés. Immatures of this species greatly outnumber adults in southern California. The northward migration begins in March and summer records are very rare.

Though Grinnell and Miller (1944) claimed this to be the most pelagic of any of the gull species that winter in California, it is now evident that this is untrue. River mouths, mudflats, and nearshore coastal waters are the usual haunts (Bent 1921, Devillers et al. 1971, Small 1974). Mew Gulls are known to occur fairly regularly on the beaches of the northern Channel Islands from December to March (Jones in prep.). It was unusual that seven hundred birds wintered near San Pedro in 1968 (McCaskie 1968b). There are no records farther offshore than the Channel Islands.

On their northern nesting grounds Mew Gulls prey upon insects, fish (both schooling and beach-cast) and scavenge on beaches and near canneries (Bent 1921, Gabrielson and Lincoln 1959). In southern California they probably consume a similar variety of items, but their habits have not been recorded in the literature.

1975-76 Baseline Data

April - October 1975. None sighted.

November 1975. Three Mew Gulls were seen at Dockweiler S.B. on the 6th.

December 1975. Our only record was of a single bird on the lagoon at P.M.T.C., Pt. Mugu.

January 1976. Apparently the majority of wintering Mew Gulls reached southern California in late December. Beach censuses from the 11th to the 18th revealed ten birds at P.M.T.C., Pt. Mugu, and 50 at Huntington S.B. Surveys close inshore along the northern islands showed 242 individuals as follows: 2 and 14 on the north and south coasts of San Miguel Is. on the 15th; 9, 115 and 3 on the west, north and eastern coasts of Santa Rosa Is. on the 16th; 91 on the east and 3 on the south coast of Santa Cruz Is. on the 16th; 4 at West Anacapa Is. and 1 at East Anacapa Is. on the 17th.

During aerial surveys from the 22nd through the 25th, 15 birds were seen from 10-25 km west of Ventura and one approximately 9 km west of Pt. Vicente.

These sightings clearly indicate the relative abundance of Mew Gulls in the Santa Barbara Channel/Northern Channel Islands area. Fewer birds appeared in Santa Monica Bay, though a substantial number were

Mew Gull (continued)

seen at Huntington S.B. We found none in the vicinity of San Diego.

February 1976. Seven were found during February beach walks, all at Santa Cruz Is. (six along west end beaches and one near Pozo Anchorage). Additional inshore surveys from the ship from the 12th through the 15th yielded sightings of 245 birds: 1 and 15 on the north and south coasts of San Miguel Is.; 41 on the south coast of Santa Rosa Is.; 27 on the south coast of Santa Cruz Is. (north coast of Santa Rosa and Santa Cruz Islands not surveyed); 174 at Anacapa Is.; 3 on the north and north-east tip of Santa Catalina Is.

Only one was found at sea (36 km southwest of Oceanside) during a standard transect cruise in mid-month.

March 1976. None were identified during aerial surveys at sea and around island shores in mid-March. Sixteen birds were scattered along the coasts of the northern islands during ship surveys a week later. Many hundreds of unidentified gulls were seen along the shores of the northern islands, however, of which some were undoubtedly this species.

Beach counts turned up two individuals: at Huntington S.B. and Silver Strand S.B.

Bonaparte's Gull (Larus philadelphia)

Bonaparte's Gull is often the most abundant larid wintering along the beaches and inshore waters of southern California. From September through May and June many thousands of these birds concentrate near sewer outfalls, harbors, beaches, and coastal marshes. On southern California Christmas bird counts, Bonaparte's Gulls have averaged over 3,500 (total) in recent years, with one phenomenal count of over 90,000 individuals in San Diego Bay (Scott 1974).

This species is rare more than 40 km from the coast, and far less common around the Channel Islands than most other species. Harrington (1975) indicates that while substantial numbers were found between the coast and Channel Islands in 1967, none were recorded between the islands and the P.O.B.S.P. Eastern Grid. Records exist for all eight Channel Islands, though they are very irregular (Jones in prep.). A few birds remain in southern California through the summer months, but the vast majority migrate northward along the coast in May.

Bonaparte's Gull nests throughout coastal and interior Alaska south of the Brooks Range, in the Yukon, Northwest Territories, and east through Manitoba. While on the nesting grounds, they are insectivorous to a greater degree than most inland nesting gulls. On the seacoast they take small, schooling fish, offal, and specialize in capturing shrimp along the faces of maritime glaciers (Bent 1921, Gabrielson and Lincoln 1959).

1975-76 Baseline Data

April 1975. On 19 April, 70 Bonaparte's Gulls were counted 4 km west of Cluster Pt., Santa Rosa Is., and 104 more were scattered evenly from there

Bonaparte's Gull (continued)

along a cruise track through Santa Cruz Basin to Santa Barbara Is. None were found between Santa Barbara Is. and Pt. Vicente two days later, and none were counted on mainland beaches.

May 1975. None were seen on mainland beaches; the only sighting along island shores was of six birds at Northwest Harbor, San Clemente Is. Three birds were sighted 15 km west of San Onofre and four more 25 km south of Long Beach on the 7th.

June - September 1975. None recorded.

October 1975. Our only records of this species were two birds at Dockweiler S.B. and one at Huntington S.B.

November 1975. Numbers increased dramatically in early November. Table III-A4-182 shows several hundred birds were present at Huntington S.B. and three other coastal sites. At sea, birds were found almost everywhere except near the northern islands (Fig. III-A4-339). Several thousand birds were present at the entrance to San Diego Bay on the 20th.

December 1975. Counts on mainland and Santa Cruz Is. beaches reached their highest yearly levels in December (Table III-A4-182). The great majority of sightings was at Huntington S.B. where birds were apparently attracted by the human activity and marshes of Newport Bay. None were found along the shores of the islands. Numbers at sea decreased from the previous month. Shipboard censusing in mid-month (Fig. III-A4-340) showed a withdrawal toward the mainland coast. Concentrations were found near Pt. Vicente, Newport, and San Diego. Aerial surveys at the same time showed a similar pattern with additonal sightings of small numbers of birds 40 km south of San Clemente Is. and a much larger concentration off Pt. Vicente. The latter area harbored well over 2,000 birds on the

Table III-A4-182. Frequency of sightings of Bonaparte's Gulls (total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975					-		-	-		-			
11-24 May					-								
13-19 June					-								
11-18 July		April through September 1975: None recorded											
1-7 August													
11-18 September											-	-	
15-18 October	0	0	0	0	0	0	2	1	0	0	-	-	3
6-14 November	1	0	0	0	42	0	24	315	0	0	0	0	382
4-11 December	0	0	0	3	39	0	69	1503	1	7	0	0	1619
11-18 January, 1976	0	0	0	0	0	0	1	1307	0	0	0	0	1308
16-24 February	0	0	0	0	0	0	0	108	0	0	0	0	108
11-22 March	0	0	0	3	0	0	0	35	0	0	0	0	38

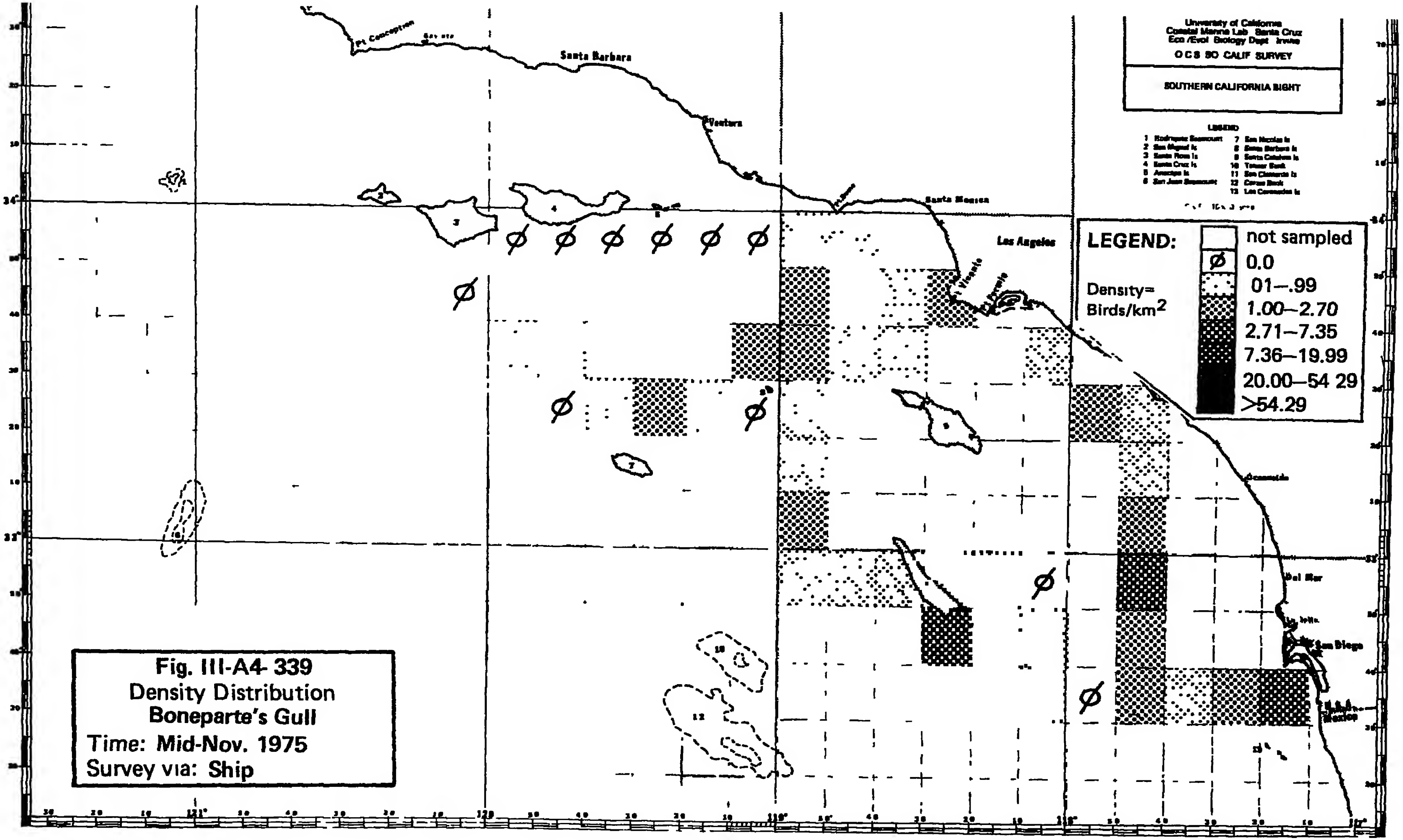


Fig. III-A4- 339
Density Distribution
Boneparte's Gull
Time: Mid-Nov. 1975
Survey via: Ship

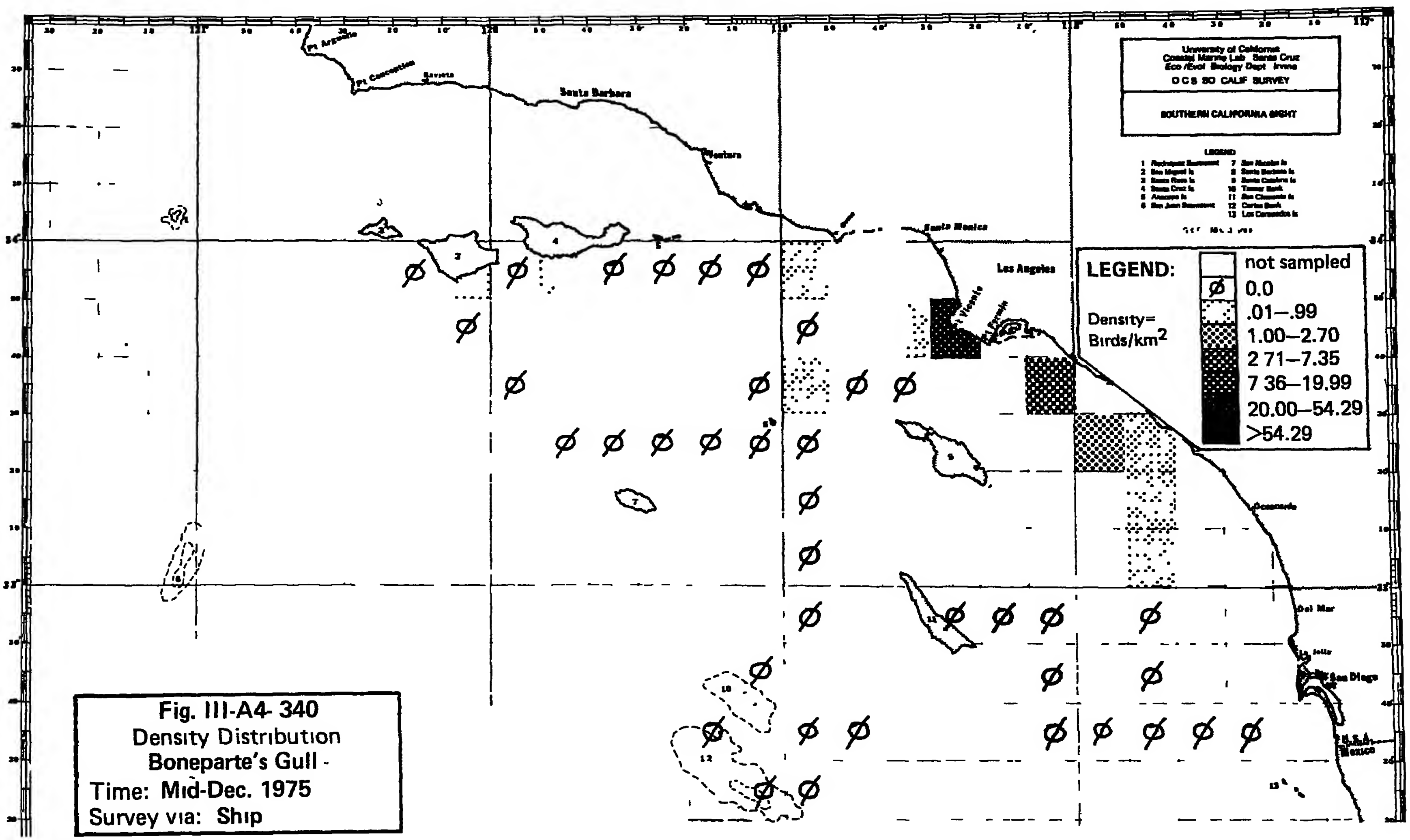


Fig. III-A4-340
Density Distribution
Boneparte's Gull -
Time: Mid-Dec. 1975
Survey via: Ship

Bonaparte's Gull (continued)

16th, part of a large mixed-species flock that was actively feeding in the vicinity of six purse-seine boats.

January 1976. The total number of birds on mainland beaches remained high in January, primarily because of the large population at Huntington S.B. (Table III-A4-182). In contrast, numbers at sea declined even more than in December. The species was found only near Gaviota (one bird), south of Santa Rosa Is. (one bird), Pt. Vicente (up to 59.4 birds/km^2 about 10 km west), and on the approach to San Diego Bay (2.11/km^2, 8 km from the coast declining to 0.08/km^2, 47 km out).

February 1976. Beach censuses from the 16th through the 24th yielded a total of 108 birds, all at Huntington S.B. Ship surveys in mid-month showed a similar decline in numbers. Only 15 birds were seen: three were 2 km south of Pt. Vicente; six were at the mouth of San Diego Bay; and six were 15 km south of Long Beach.

March 1976. Thirty-eight Bonaparte's Gulls were found in island and mainland beaches, most at Huntington S.B. None were recorded at sea.

Heermann's Gull (Larus heermanni)

Unlike any other gull in southern California waters, Heermann's Gull migrates north in autumn and south in winter and spring. The species nests primarily in the Sea of Cortés, but a few colonies have been recorded from Mazatlan, Sinaloa, and Magdalena Bay, Baja California (Bent 1921). In most years, northward movement begins in May, with many birds appearing in southern California by the first of June. Numbers remain high throughout the fall and decline in winter as adults return to the south for nesting. Egg-laying usually begins in April. Some birds, presumably non-breeders, remain in southern California through the spring and summer (Bent 1921, Grinnell and Miller 1944, Small 1974).

Heermann's Gulls are often quite numerous on southern California mainland and island beaches and for a short distance offshore. Scott (1974) summarized Christmas Bird Count data from 1963-1971 and found that, while the total numbers of individuals reported each year averaged 556, one count exceeded 13,000. The species is common as far out as the Channel Islands (Jones in prep.), but apparently not much beyond. Jehl (1973b) found one bird 93 km off Pt. Conception in mid-October 1971, but Harrington (1975) reported none reached the P.O.B.S.P. Eastern Grid in 1967.

The food habits of Heermann's Gulls have been described by Bent (1921), Nogueron (1969), and Quinlivan (1974a, b ms). The species preys heavily on fish throughout its range, and is much less accustomed to scavenging in dumps and along beaches than some of its larid relatives. Forty-five birds collected in Monterey Bay in 1971 and 1974, and at two sites in southern California in 1971, had eaten sand crabs, juvenile squid, juvenile rockfish (Sebastes), anchovy (Engraulis), and other fish species. Birds nesting at Isla Raza in the Sea of Cortés

relied heavily upon clupeids and engraulids. Heermann's Gulls are known for their habit of stealing fish from Brown Pelicans (Bent 1921).

1975-76 Baseline Data

April 1975. None recorded.

May 1975. A single Heermann's Gull was recorded on Santa Cruz Is. (Table III-126) but none were seen on the mainland beaches we censused. Two birds were recorded 4 km northwest of Castle Rk., San Miguel Is. on the 13th.

June 1975. Northward dispersal was in progress by late June. On mainland beaches several hundred birds were counted, mostly at Los Angeles and Orange Co. beaches (Table III-126). Birds were scattered throughout the Channel Islands, with over 100 individuals each at Santa Rosa, Santa Catalina, and San Clemente Islands (Table III-126). A single bird was recorded at sea approximately 2 km south of Pt. Conception on the 27th.

July 1975. Beach surveys in mid-July revealed many more Heermann's Gulls than in the preceding month. They were present in large numbers at Los Angeles and Orange Co. beaches, and over 100 were found on Santa Cruz Is. (Table III-126). None were recorded at sea during a mid-month cruise that took in most of the central third of the study area. Later in the month (21st through 26th), a total of 11 birds was counted at widely scattered offshore locations. Only the areas 4 km southwest of Santa Cruz Channel and 6 km northeast of Pyramid Head, San Clemente Is. produced offshore records of more than one individual (four birds each).

August 1975. Surveys on Channel Island and mainland beaches from the 1st through the 7th produced somewhat higher totals than in July (Tables III-126,

Table III-A4-183.

Frequency of sightings of Heermann's Gulls (total individuals)on and near Channel Island beaches, April 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Location / Date→ / Type→	27-30 Jun 75 Air	4-7 Aug 75 Air	23-26 Oct 75 Air	22-25 Jan 76 Air	11-14 Feb76 Ship				
SAN MIGUEL IS.									
Richardson Rk. (103)	0	0	0	0	-				
West (102,110-20,160,170)	60	2	39	11	0				
South (146-51)	0	0	0	1	0				
East (101,140-45)	0	16	10	0	13				
North (121-40)	0	11	2	9	0				
SANTA ROSA IS.									
West (611-12,625)	0	0	51	0	-				
South (620-24)	0	39	0	6	14				
East (618-19,629)	101	69	0	1	-				
North (610,613-17)	25	0	0	0	-				
SANTA CRUZ IS.									
West (641,658)	0	36	0	4	-				
South (650,653-56)	0	50	11	1	28				
East (649,651)	0	20	0	6	-				
North (640,643-48)	0	45	0	0	-				
ANACAPA IS. (660-80)	0	-	-	-	-				
SAN NICOLAS IS.									
Northwest (210-60)	0	0	10	1	-				
Southwest (203)	0	0	0	0	-				
Southeast (202)	0	0	1	0	-				
Northeast (201)	0	0	0	0	-				
SANTA BARBARA IS.(300-330)	0	0	0	0	7				
SANTA CATALINA IS.									
Northwest (506-07,515, 525-27)	2	16	8	0	1				
Southwest (503-05,529)	26	27	0	0	-				
South (502,523-24)	50	7	1	1	-				
East (501,509-11)	35	23	0	0	19				
Isthmus (508,521-522)	4	65	0	0	4				
SAN CLEMENTE IS.									
Northwest (409-11)	51	76	13	1	-				
West Central (406-08)	50	0	0	32	-				
Southwest 404-05)	0	0	2	0	-				
Pyramid Cove (402-03)	0	-	1	0	-				
East 401,412)	0	-	-	-	-				

III-A4-183). Among the islands, the species was more common on Santa Cruz, Santa Catalina, and Santa Rosa Islands than elsewhere. Fairly large numbers were recorded from McGrath S.B. to San Onofre S.B. on the mainland. These beach counts were the highest for the entire year. The species was uncommon at sea; only six birds were seen (one, just off the beach at Oceanside; five 10 km west of Pt. Vicente), and these were close to the coast.

September 1975. A total of 61 was recorded in the course of 12 days of shipboard censusing throughout the study area; only one was more than 2 km offshore. Two birds were found at South Pt., Santa Rosa Is., 50 at Northwest Harbor, San Clemente Is., and eight at the San Pedro Breakwater. A lone "offshore" record was from 10 km west of Pt. Vicente.

Numbers on mainland and Santa Cruz Is. beaches remained high with a maximum count of 668 at Dockweiler S.B. (Table III-126).

October 1975. Sightings of nine birds were recorded in the course of open ocean aerial surveys from the 23rd to the 26th. None were more than a few km from the mainland or the Channel Islands. Seven of these were just north of San Miguel Is.; one was just off the beach west of Ventura; one, just north of Bird Rk., Santa Catalina Is.

Beach counts of this species had declined considerably from the preceding month: birds were not plentiful anywhere on the islands, although San Miguel and Santa Rosa Islands had a larger proportion of birds than was the case earlier in the year (Table III-A4-183). Mainland counts were also considerably lower (Table III-123) with Dockweiler, Huntington, and San Onofre State Beaches harboring the largest number of birds. The total count on seven mainland beaches (283 birds) was less than 25% of the September count on the same beaches.

Heermann's Gull (continued)

November 1975. Beach counts remained at about the levels recorded a month earlier (Table III-126) and the central beaches continued to have the largest number of birds. Only two birds were found at sea, both 9 km south of Santa Cruz Is.

December 1975. Two were sighted in the course of aerial surveys of the islands in mid-month, one each on Santa Rosa and San Clemente islands. Forty-four were recorded at Prisoner's Harbor, Santa Cruz Is. on the 7th. Mainland beach censuses yielded a total of 369 birds, most of which were found at Dockweiler S.B. At several beaches the number of birds had decreased to zero since the previous counts, and only one was seen on three San Diego Co. beaches (17.3 linear km censused).

January 1976. During both ship and aircraft surveys, 345 were counted at sea. Of these, 339 were part of a mixed-species flock that included a total of approximately 2,500 loons, cormorants, pelicans, gulls, murres, and California sea lions. This assemblage was located 20 km south of the city of Santa Barbara. One bird each was encountered in San Miguel Passage, 8 km south of Anacapa Passage, and 6 km west of Pt. Vicente; three more were seen 2 km off Pt. Loma. Table III-126 shows that the number of Heermann's Gulls on mainland and Santa Cruz Is. beaches dropped considerably in late December and early January. As was the case throughout the sampling period, the beaches in Los Angeles and Orange Counties had the largest number of birds. A few individuals remained on Channel Is. beaches (Table III-A4-183).

February 1976. Ship surveys from the 9th through the 14th indicated the presence of a few birds at five offshore locations as follows: single birds 16 and 35 km northeast of Santa Barbara Is. and 25 km southwest

Heermann's Gull (continued)

of San Diego; four just outside San Diego Bay; one, 15 km southwest of Oceanside. Several dozen birds were found scattered along the inshore waters of the four northern islands, and Santa Barbara and Santa Catalina Islands (Table III-A4-183), but only three were counted on mainland beaches (Table III-126).

March 1976. Three birds sighted: one at Prince Is. on the 17th, one at Ford Pt., Santa Rosa Is. on the 19th; the last on the south coast of Santa Cruz Is. a day later.

Black-legged Kittiwake (Rissa tridactyla)

The Pacific form of Black-legged Kittiwake nests on inaccessible ledges on islands and coastal cliffs from Cape Lisborne, Alaska in the north throughout the Bering Sea, Bristol Bay, Aleutian Islands, Shumagins, and perhaps to the Cordova area on the Gulf of Alaska (A.O.U. 1957, Gabrielson and Lincoln 1959). It is certainly the most abundant larid in its breeding range. It often remains in these latitudes until October, when the first storms of winter and the presence of pack ice force it to move toward less climatically-hostile areas in the south (Gabrielson and Lincoln 1959). Kittiwakes winter far out to sea, from the Aleutians south, only sporadically to southern California, usually arriving in the latter area in December or January. By April, most return toward their nesting grounds (Bent 1921, Harrington 1975).

Most authors agree that there is wide variation in abundance of kittiwakes in nearshore southern California waters from year to year (c.f. McCaskie 1967 through 1975, Scott 1974, Bender et al. 1974). McCaskie indicates that the winters of 1967, 1969, 1970, 1971, 1972, 1974, and 1975 produced many "offshore" records (referring to the area between the coast and Channel Islands), but in 1968 and 1973 kittiwakes were virtually absent. It seems likely that yearly variations occur in latitudinal, longitudinal and age-composition patterns.

Kittiwakes were common in the P.O.B.S.P. Eastern Grid in January and February, 1967 (Harrington 1975). Total numbers of kittiwakes decreased from north to south off southern California in that year, but relative densities were constant with distance as far as 740-945 km from the coast. Immature birds outnumbered adults offshore; the ratio was highest in the central and southern two-thirds of the P.O.B.S.P. Eastern

Grid. Inshore of the P.O.B.S.P. study area, adults were outnumbered by immatures about nine to one. Similarly, Jones (unpubl. notes) has found many more immature than adult kittiwakes in Channel Is. waters during the past three years.

Black-legged Kittiwakes prey upon a variety of schooling fishes, invertebrates, and carrion during the nesting season (Bent 1921, Gabrielson and Lincoln 1959, Hunt et al. 1975), but nothing has been published on their winter feeding habits.

1975-76 Baseline Data

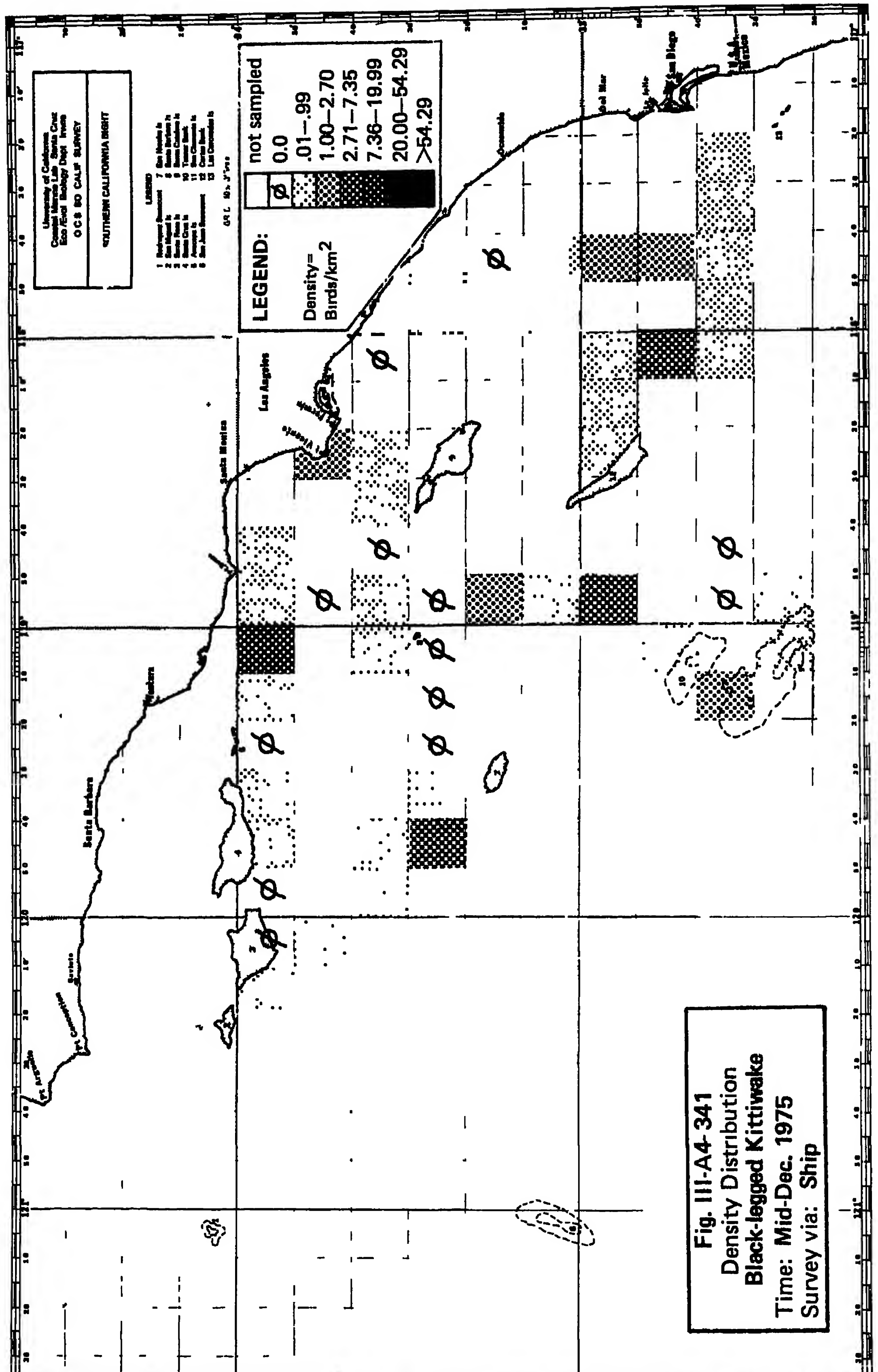
April 1975. Two individuals recorded 39 km southeast of Santa Rosa Is. on the 19th.

May - October 1975. None recorded.

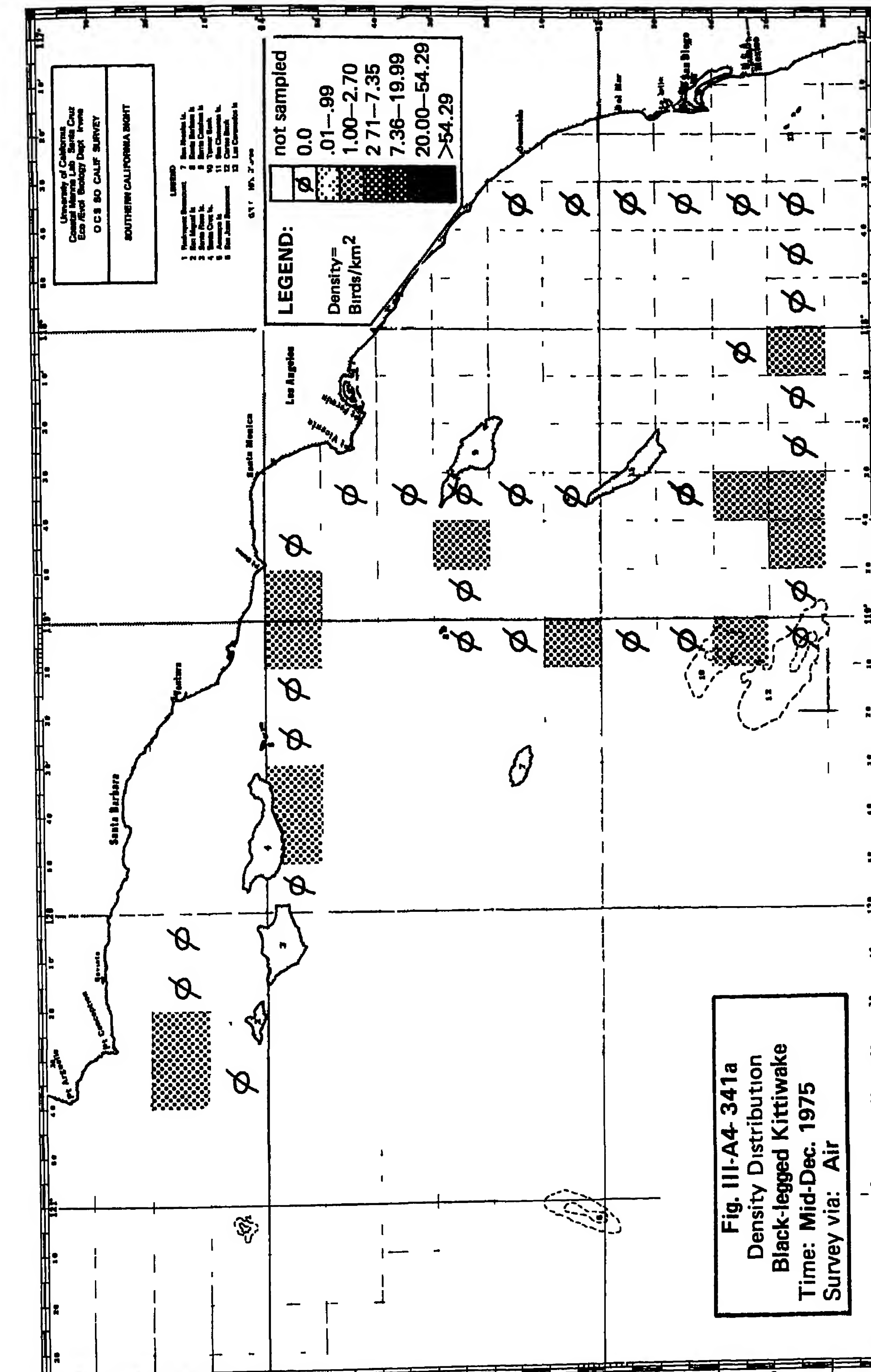
November 1975. Two records only, both of single birds: one 22 km west of Northwest Harbor, San Clemente Is.; the other, 2 km west of Pyramid Cove, San Clemente Is.

December 1975. One seen at Dockweiler S.B. on the 4th. The species was found widely through the study area in the course of ship and aircraft surveys in mid-month (Figs. III-A4-341 and 341a). The areas of highest density were 10 km northwest of San Miguel Is. and 19 km southeast of Anacapa Is. Relatively uniform low densities were found elsewhere.

January 1976. Found on island and mainland beaches as follows: Santa Cruz Is., Fraser Pt., three individuals; Santa Barbara Is., two; Santa Catalina Is., West End, one; Ben Weston Pt., 266; P.M.T.C., Pt. Mugu, and San Onofre S.B., one each.



III-A4-1104



III-A4-1104 a

Black-legged Kittiwake (continued)

A tremendous influx of birds was registered in the waters east of 120°30'W (Fig. III-A4-342). Huge concentrations were found on the Santa Rosa-Cortés Ridge and at Cortés Bank, and moderate to high densities were recorded almost everywhere else. Few birds were found west of the Patton Escarpment. Adults outnumbered young birds by 21:1 in a randomly selected sample of 48 shipboard sightings (68 birds).

February 1976. None were recorded on mainland beaches. From the 11th through the 13th, small numbers were counted along inshore areas next to San Miguel and Santa Rosa Islands with about 1,500 birds between Yellowbanks Anchorage, Santa Cruz Is. and West Anacapa Is. Black-legged Kittiwakes were abundant offshore during mid-month ship transects, with particularly large aggregations along the northern and western margins of Santa Cruz Basin (Fig. III-A4-343). Lower densities were found south and east of Santa Barbara Is.

Adults outnumbered immature birds by a ratio of 9:1 in a randomly selected sample of 69 shipboard sightings (411 individuals).

March 1976. Four were seen at P.M.T.C., Pt. Mugu, two at Pt. Mugu S.B., and three more at South Carlsbad S.B. from the 11th through the 22nd; all were adults. In mid-month, aerial surveys revealed 16 kittiwakes near Carrington Pt. and 208 near South Pt. on Santa Rosa Is., and an additional three near Ben Weston Pt., Santa Catalina Is.

The species continued to be abundant at sea, though not as concentrated geographically as in January (Fig. III-A4-344). Higher densities were recorded west of 118°30'W than to the east, particularly in the vicinity of the northern islands and along the Santa Rosa-Cortés Ridge. Birds were most common at distances greater than 10 km from the mainland

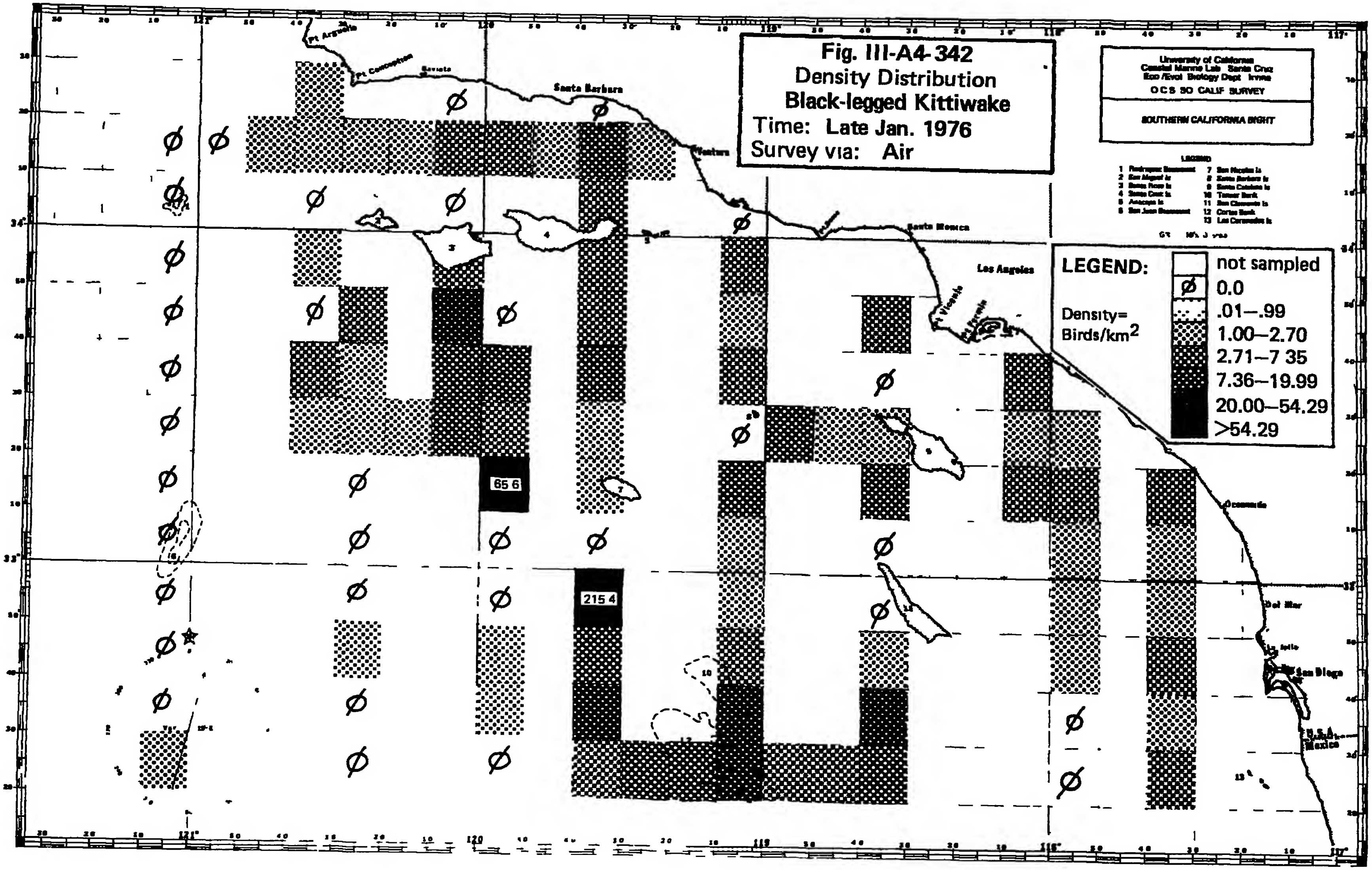


Fig. III-A4-342
Density Distribution
Black-legged Kittiwake
Time: Late Jan. 1976
Survey via: Air
University of California
Coastal Marine Lab Santa Cruz
Eco/Evol Biology Dept Irvine
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
LEGEND:
Density=
Birds/km2
not sampled
Ø 0.0
.01–.99
1.00–2.70
2.71–7 35
7.36–19.99
20.00–54.29
>54.29
65 6
215 4
Pt Arguello
Pt Conception
Santa Barbara
Ventura
Santa Monica
Los Angeles
Oceanside
Del Mar
San Diego
U.S.A.
Mexico

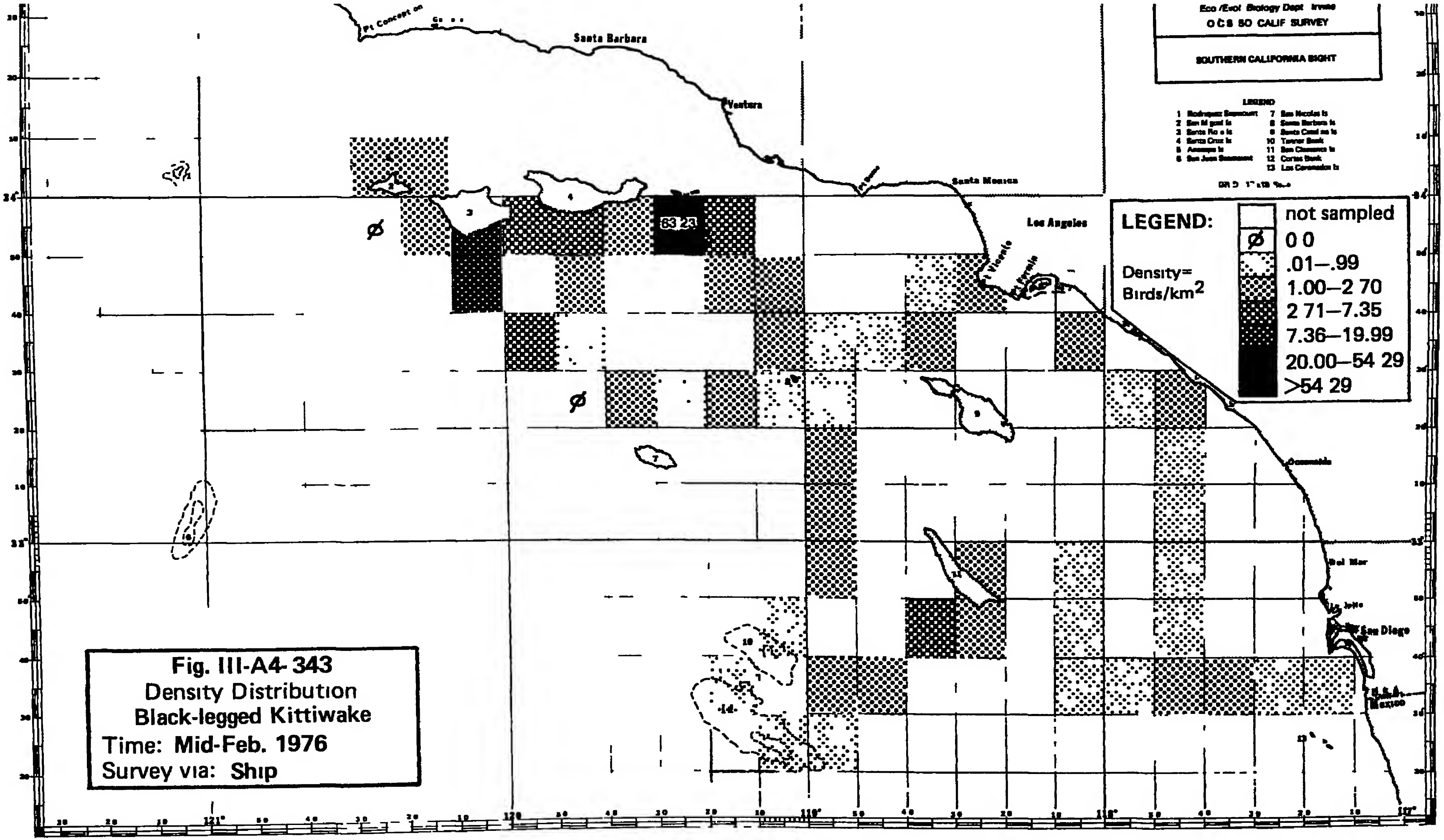


Fig. III-A4- 343
Density Distribution
Black-legged Kittiwake
Time: Mid-Feb. 1976
Survey via: Ship

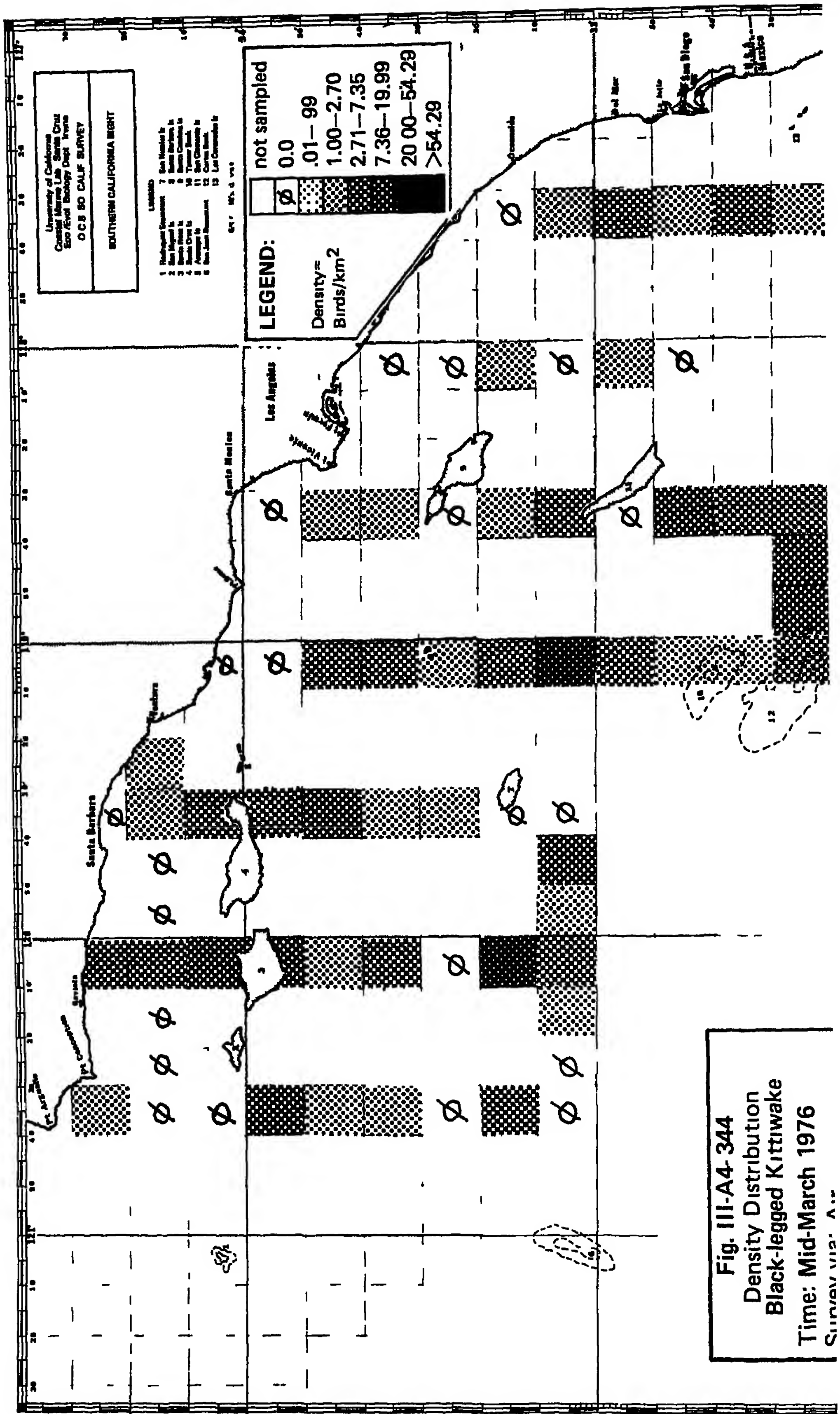


Fig. III-A4-344
Density Distribution
Black-legged Kittiwake
Time: Mid-March 1976

shore. Adults outnumbered young birds by 501:1 in a randomly selected sample of 143 sightings (1,504 individuals) recorded aboard ship in mid-March.

Sabine's Gull (*Xema sabini*)

This species and the Black-legged Kittiwake are the most oceanic of the gulls that frequent the coast of California. Sabine's Gulls occur strictly as transients between Alaskan nesting grounds and their largely unknown (presumably southern hemispheric) wintering areas. In southern California waters the northward migration occurs from late April through early June, with the peak about 15 May. There are a few sightings in July (McCaskie 1975), but the bulk of fall migration passes in August through mid-October. Migratory flocks in autumn may average somewhat larger than in spring; occasionally several hundred birds are recorded on a single offshore trip in autumn (Scott 1974).

The species is accidental inland and relatively rare along the immediate coastline (Grinnell and Miller 1944, Small 1974), being more abundant farther out to sea. Sabine's Gulls were present in the P.O.B.S.P. Eastern Grid in April 1967.

On the tundra and seacoasts of its summer nesting range, Sabine's Gull takes a variety of insect and other invertebrate prey and small fish (Bent 1921). Little is known of its food habits while at sea.

1975-76 Baseline Data

April 1975. The only record was a single bird seen 40 km southeast of Santa Rosa Is. on the 19th.

May 1975. On 14 May, nine Sabine's Gulls were counted 10 km southwest of San Miguel Passage. All were headed northwest. Two more were recorded 35 km southeast of Santa Rosa Is. on the 27th.

June - August 1975. None recorded.

Sabine's Gull (continued)

<u>September 1975</u>. Three records exist inshore of the Patton Escarpment. One bird was found 35 km northwest of San Nicolas Is. on the 10th, one at Cortés Bank on the 11th, and the third was 20 km southeast of Avalon, Santa Catalina Is. on the 13th. None were found at these locations on a cruise two weeks later.

<u>October 1975 - February 1976</u>. None recorded.

<u>March 1976</u>. A single bird was sighted 37 km east of Avalon, Santa Catalina Is. on the 13th.

Forster's Tern (<u>Sterna forsteri</u>)

Forster's Tern nests in colonies in fresh salt water marshes throughout temperate North America from Ontario to Virginia in the east to central California on the west, and from central Alberta south to southern Texas. One coastal breeding colony exists at the south end of San Diego Bay. The species migrates by way of inland routes to the southern United States and South America for the winter.

These terns are present in California throughout the year, although their abundance changes locally with the seasons (Grinnell and Miller 1944; Small 1974). Townsend (1968) notes they are found offshore at San Nicolas Is. from October to March, most frequently in December; however, others have not found them there (Jones in prep.).

The food of this species consists almost exclusively of small fish that inhabit very shallow water.

1975-76 Baseline Data

<u>April 1975</u>. None recorded.

<u>May 1975</u>. Ten birds were seen at McGrath S.B. in mid-May (Table III-129). A single Forster's Tern was seen at sea, 15 km west of Newport Beach, Orange Co., on the 7th.

<u>June 1975</u>. Nineteen birds were counted on two San Diego Co. beaches; the species went unrecorded elsewhere.

<u>July - September 1975</u>. Nine or ten individuals were seen each month from a variety of mainland beaches (Table III-129).

<u>October 1975</u>. Total numbers of Fortster's Terns increased to 57 with the majority at Dockweiler S.B. (Table III-129). As was the case throughout the study year, none were seen on the eight Channel Islands.

Forster's Tern (continued)

November 1975. The highest total of the year occurred in mid-month; of 77 birds counted at nine mainland beaches, 38 were found at Dockweiler S.B. and 21 at P.M.T.C., Pt. Mugu (Table III-129).

December 1975. Total numbers decreased in December (Table III-129); the largest number, 10, was found at Huntington S.B.

January 1976. None recorded.

February 1976. Twelve birds at P.M.T.C., Pt. Mugu, two at Dockweiler S.B., and one at Silver Strand S.B. comprised our only sightings.

March 1976. Fifty-two were recorded along the mainland beaches surveyed, including 24 at Border Field S.B. and 16 at McGrath S.B. (Table III-129).

Common Tern (Sterna hirundo)

Common Terns nest throughout North America east of the Rockies from the Canadian Low Arctic to the Gulf of Mexico (Bent 1921, A.O.U. 1957). The habits of Common Terns along coastal California are poorly known. They occur as pure transients, migrating north in late March through May and south from August through December. Very few are sighted in southern California in summer, and only a few birds occasionally overwinter, all in the San Diego area (Weghe 1970, McCaskie 1975). Most authors state that they are more numerous in autumn than spring (Grinnell and Miller 1944, Small 1974), but few reliable, quantitative data have been published.

There seems to be little doubt that Common Terns are relatively rare far offshore (where the Arctic Tern predominates) (Pyle and DeLong 1968 ms, Jehl 1973b). They probably migrate through waters over the continental shelf and along the mainland coast. Records from the vicinity of the Channel Islands are scarce. Offshore boat trips in fall have sighted a few individuals between the islands and mainland, but they are progressively more abundant toward the mainland coast (McCaskie 1970a, 1972a, 1973a, etc.).

While on their nesting grounds, these birds typically feed upon small fish, particularly sand lance (Ammodytes), and a variety of invertebrates, including insects (Bent 1921). Their food habits along the Pacific coast are unknown, but it is likely that they, like other terns, take small schooling fishes, squid, and crustaceans.

1975-76 Baseline Data

Note: for distribution of unidentified Common/Arctic Terns, refer to description of latter species.

Common Tern (continued)

April 1975. None recorded.

May 1975. One Common Tern was seen 10 km off Dana Pt., Orange Co. on the 7th.

June - August 1975. None recorded.

September 1975. Substantial numbers appeared along the coast in mid-month. Ninety-one were seen at Dockweiler S.B. on the 11th and seven more were recorded at Huntington S.B. on the 17th. Two cruises offshore in September produced records of Common Terns in two areas: nine birds were found 10 km south of Bowen Pt., Santa Cruz Is. on the 23rd, and two were seen at Tanner Bank on the 25th. Many unidentified terns were also seen offshore as discussed with Arctic Terns, below.

October 1975. Three Common Terns were found in the course of mid-month beach censuses: one at Dockweiler S.B. and two at Huntington S.B. None were found at sea.

November 1975. One bird at P.M.T.C., Pt. Mugu, on the 11th and three at Dockweiler S.B. on the 6th were our only sightings.

December 1975 - March 1976. None recorded.

Arctic Tern (Sterna paradisaea)

Arctic Terns nest in small, scattered colonies throughout Alaska, arctic and sub-arctic Canada and around the pole in Greenland, northern Europe, and Asia. They undergo a yearly migration that takes them to the Antarctic Ocean (as far as 76°S) and back (Bent 1921). Off California shores the species is purely migratory, passing north in late April and May and south from August through September.

Observers in southern California waters seldom encounter Arctic Terns in spring. The species is more common in fall when up to several hundred per day may be recorded on offshore cruises. It is seldom found close inshore or near the Channel Islands, preferring the cool California Current waters west of the continental margin (Willet 1933, Grinnell and Miller 1944, Small 1974). Pyle and DeLong (1968 ms) reported that Arctic Terns passed through the P.O.B.S.P. Eastern Grid in September and early October but not in spring. Jehl (1973b) found three individuals about 111 km off Pt. Conception on 18 October 1971 (the latest record for the region).

The food habits of Arctic Terns during migration are unknown. It seems probable, however, that the diet consists largely of small fish and invertebrates plucked from the sea surface, as is the case on the nesting grounds (Bent 1921, Gabrielson and Lincoln 1959).

1975-76 Baseline Data

April 1975. None recorded.

May 1975. Several found at locations east of Santa Càtalina Is. on the 7th: one was 16 km southwest of Newport Beach, Orange Co.; nine were 18 km west of Dana Pt., Orange Co.; and two were 38 km northwest of La Jolla, San Diego Co.

Arctic Tern (continued)

Six unidentified terns, perhaps of this species, were sighted 12 km north of Santa Catalina Is. on the 10th.

June 1975. None recorded.

July 1975. Three Arctic Terns were seen 15 km north of Santa Catalina Is. on the 21st and one was seen at Santa Cruz Is. on the 14th.

August 1975. Fall migration apparently began in early August. Unidentified terns, probably of this species, were sighted as follows: three, 45 km northwest of San Nicolas Is.; two, 6 km southwest of San Miguel Is.; two, 4 km northwest of San Miguel Is. Substantial numbers of Arctic and unidentified terns were recorded on a cruise in late August (Fig. III-A4-345).

September 1975. Two cruises in September produced numerous sighting records in waters offshore of and along the Santa Rosa-Cortés Ridge. Most of the sightings of unidentified terns migrating in company with Arctic Terns may also be referrable to *S. paradisaea*. Obvious areas of concentration were northwest of San Nicolas Is. and at Tanner and Cortés Banks (Fig. III-A4-346).

October 1975 - March 1976. None recorded.

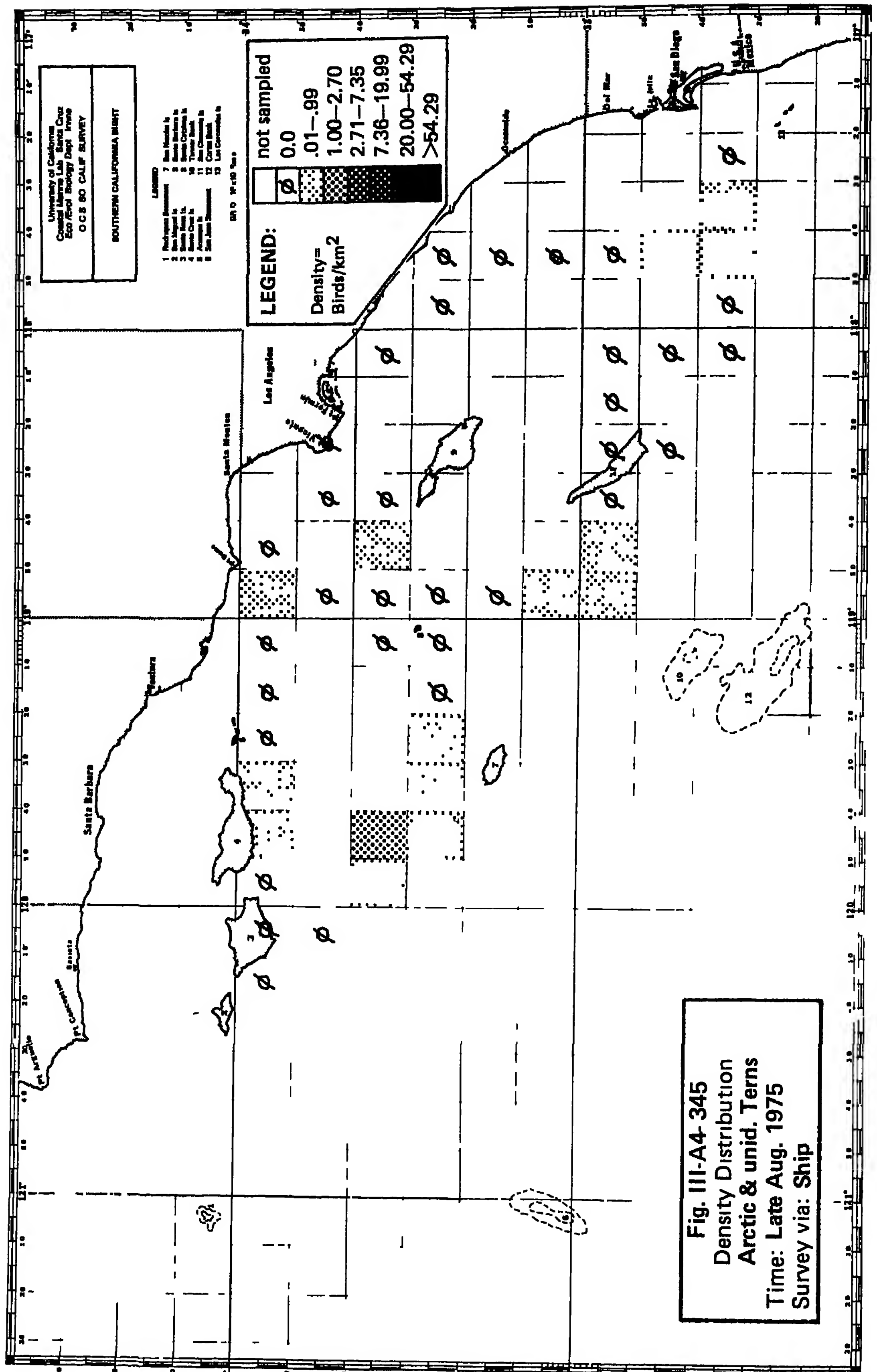


Fig. III-A4-345
Density Distribution
Arctic & unid. Terns
Time: Late Aug. 1975
Survey via: Ship

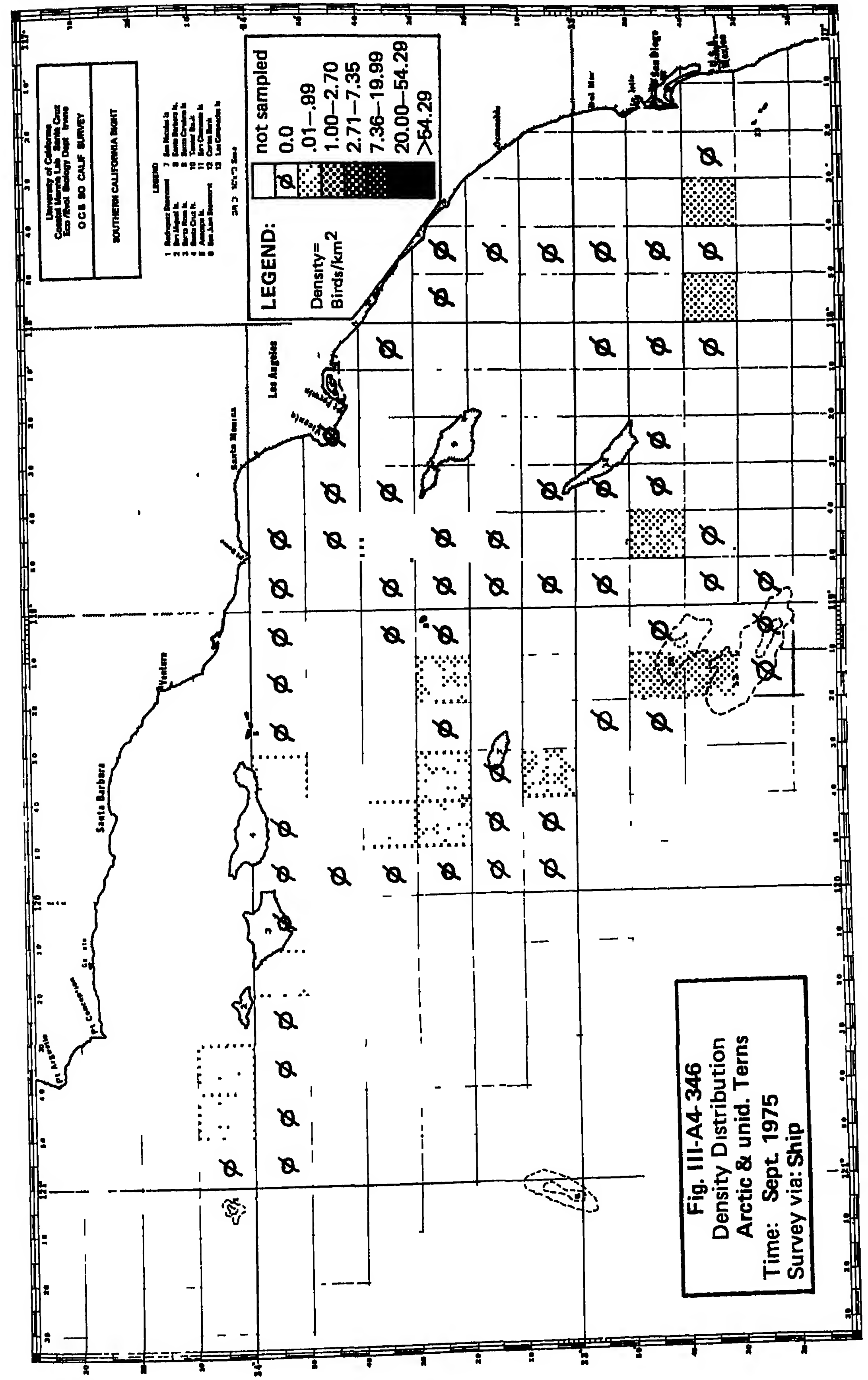


Fig. III-A4-346
Density Distribution
Arctic & unid. Terns
Time: Sept. 1975
Survey via: Ship

Least Tern (Sterna albifrons)

Least Terns are principally summer breeders along the coasts of southern and central California, with records as far north as San Francisco Bay.

Least Terns arrive and begin to nest in southern California by April. Nesting colonies are usually situated on sandy beaches near estuaries, and nests are constructed in shallow scrapes or depressions. These terns were formerly abundant and widespread nesters on the southern California caost (Willet 1933, Grinnell and Miller 1944), but increased human usage of the beaches has reduced the local breeding population to dangerously low numbers. Craig (1971) states that in 1970 only 300 pairs nested at the 14 remaining sites. In 1972, 300 pairs nested at the Santa Margarita rivermouth, the last major southern California colony (Swickard 1972). Nesting is completed by September, but some birds may linger through autumn. In winter, Least Terns range along the Pacific coast from Baja California to South America (Bent 1921).

Foraging is fairly restricted to coastal surf lines, estuaries and harbors; few, if any, offshore records exist. Fish such as anchovy (Anchoa compressa), top smelt (Atherinops affinis), killifish (Fundulus parvipinnis) and others make up the primary food source, but small crustaceans and beach insects may be taken (Swickard 1972, Scott 1974).

1975-76 Baseline Data

April 1975. None recorded.

May 1975. Several Least Terns were observed feeding in Long Beach Harbor on the 10th.

June 1975. Recorded as present on breeding colony at Huntington S.B. on the 17th.

Least Tern (continued)

July 1975. Fourteen Least Terns including three newly fledged birds were seen in the vicinity of the breeding colony at Huntington S.B. during beach surveys on the 18th.

August 1975. Two adult birds were seen at a nest at the Border Field S.B. colony in early August. One adult with a bird of the year was observed at McGrath S.B. on the 1st. Twenty-six Least Terns, occupying 11 nests were found at the P.M.T.C., Pt. Mugu, on the 6th by E. Colley and Cdr. R. Baker (pers. comm.) during beach surveys. Two newly hatched chicks were found dead at the same location.

September 1975. Nine birds were observed at the P.M.T.C., Pt. Mugu, beaches on the 16th by E. Colley.

October 1975. None recorded.

November 1975. One bird was found dead on the 26th at P.M.T.C., Pt. Mugu by E. Colley. Least Terns were also seen in small numbers at San Diego Harbor on the 20th.

December 1975 - March 1976. None recorded.

Royal Tern (Thalasseus maximus)

Royal Terns breed along the west coast of Mexico north to central Baja California. There is also one breeding record for south San Diego Bay (Gallup and Bailey 1960). In late summer, they disperse northward into southern California where many remain through the winter. The species occurs regularly in small numbers in coastal lagoons and outer beaches of the southern California mainland north to Santa Barbara Co. from late summer until early spring. Non-breeding birds occasionally spend the summer in San Diego. On the Channel Islands, where it is the only normally occurring tern, the Royal Tern is a fairly common visitor to islands with sandy beaches from July until March (Jones in prep.).

Royal Terns usually forage over the open sea near islands or the mainland; they appear to utilize coastal lagoons to a lesser extent than Elegant, Caspian, and Forster's Terns. They prey upon schooling fish, taken by plunge-diving (Bent 1921).

1975-76 Baseline Data

April - August 1975. Seventy-seven at San Miguel Is., and one more at Santa Rosa Is. from 4-7 August were the only records.

September 1975. Royal Terns were found at Santa Cruz Is. and P.M.T.C., Pt. Mugu (Table III-A4-184). None were found at sea.

October 1975. A single bird was found 4 km south of San Nicolas Is. on the 25th. Surveys around island beaches from the 23rd through the 26th revealed the species to be common among the northern islands and on San Nicolas Is., but less so to the east (Table III-A4-185). Counts on mainland beaches about 10 days earlier gave much lower totals (Table III-A4-184).

(total individuals) at selected southern California beaches April 1975 through March 1976. Dash indicates beach not surveyed. Numbers in parentheses are lengths of beach surveyed in km.

	Santa Cruz, North	Santa Cruz, West	Santa Cruz, South	McGrath S.B.	P.M.T.C., Pt. Mugu	Pt. Mugu S.B.	Dockweiler S.B.	Huntington S.B.	San Onofre S.B.	South Carlsbad S.B.	Silver Strand S.B.	Border Field S.B.	Totals
	(4.3)	(4.2)	(5.7)	(3.0)	(3.1)	(3.3)	(5.6)	(3.3)	(5.0)	(9.3)	(5.7)	(2.6)	(56.8)
11-27 April, 1975	None recorded				-		-	-		-			
11-24 May	None recorded				-								
13-19 June	None recorded												
11-18 July	None recorded												
1-7 August	None recorded												
11-18 September	0	13	0	0	1	0	0	0	0	0	-	-	14
15-18 October	0	0	0	0	0	0	2	0	0	0	-	-	2
6-14 November	0	17	5	0	28	0	0	0	0	1	9	22	60
4-11 December	2	0	1	0	0	0	0	0	0	0	0	13	16
11-18 January, 1976	0	0	2	0	5	0	0	0	0	0	0	0	7
16-24 February	0	12	0	0	47	0	0	0	0	0	0	4	63
11-22 March	0	1	0	0	5	0	0	0	0	0	0	0	6

Table III-A4-185.

Frequency of sightings of Royal Terns
(total individuals)on and near Channel Island beaches, April 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Date→	27-30 Jun 75	4-7 Aug 75	23-26 Oct 75	16-18 Dec 75	6 Jan 1976	22-25 Jan 76
Location Type→	Air	Air	Air	Air	Air	Air
SAN MIGUEL IS.						
Richardson Rk. (103)	(None Recorded)	0	0	-	-	0
West (102,110-20,160,170)		0	33	-	-	9
South (146-51)		77	0	-	-	0
East (101,140-45)		0	0	-	-	0
North (121-40)		0	0	-	-	2
SANTA ROSA IS.						
West (611-12,625)		1	47	3	-	7
South (620-24)		0	0	0	-	0
East (618-19,629)		0	37	1	-	1
North (610,613-17)		0	29	0	-	3
SANTA CRUZ IS.						
West (641,658)		0	57	0	-	0
South (650,653-56)		0	1	0	-	4
East (649,651)		0	0	0	-	0
North (640,643-48)		0	6	0	-	0
ANACAPA IS. (660-80)		-	-	-	-	-
SAN NICOLAS IS.						
Northwest (210-60)		0	0	-	3	0
Southwest (203)		0	15	-	5	0
Southeast (202)		0	8	-	3	0
Northeast (201)		0	-	-	14	0
SANTA BARBARA IS.(300-330)		0	0	0	-	0
SANTA CATALINA IS.						
Northwest (506-07,515, 525-27)		0	0	-	-	0
Southwest (503-05,529)		0	15	-	-	0
South (502,523-24)		0	0	-	-	0
East (501,509-11)		0	0	-	-	0
Isthmus (508,521-522)		0	0	-	-	0
SAN CLEMENTE IS.						
Northwest (409-11)		0	3	73	-	0
West Central (406-08)		0	2	0	-	0
Southwest 404-05)		0	0	0	-	0
Pyramid Cove (402-03)		0	4	0	-	-
East 401,412)		0	-	-	-	-

Royal Tern (continued)

November 1975. Royal Terns were present in moderately high numbers at western Santa Cruz Is., P.M.T.C., Pt. Mugu, and near San Diego from the 6th through the 14th. The relative abundance of these birds at sites adjacent to coastal lagoons was clear, though their absence from McGrath S.B. was somewhat surprising (Table III-A4-184). None were found at sea.

December 1975. Incomplete surveys of the shores of the islands in mid-month revealed a flock of 73 on Bird Rk., San Clemente Is., and small numbers at Santa Rosa Is. (Table III-A4-185). Beach walks 10 days earlier indicated a decline in numbers at mainland sites (Table III-A4-184). Most birds were found at Border Field S.B., and a few on Santa Cruz Is. None were recorded at sea.

January 1976. One bird was seen 9 km north of San Clemente Is. on the 22nd. Small numbers were found along mainland and Channel Islands beaches during beach walks from the 11th through the 18th and on aerial surveys from the 22nd through the 25th (Tables III-A4-184, 185). As in the preceding four months, more Royal Terns were present at San Miguel and Santa Rosa Islands than elsewhere.

February 1976. Substantial numbers were found at Santa Cruz Is. and P.M.T.C., Pt. Mugu, during mid-month beach surveys (Table III-A4-184). One was seen on the south coast of San Miguel Is. on the 12th. None were recorded at sea.

March 1976. The species was almost absent from the islands during aerial surveys from the 12th through the 15th. Only four birds were found, all on the southwest coast of Santa Catalina Is. (Ben Weston Pt.). On the mainland, numbers had declined considerably from those recorded in February (Table III-A4-184); again the majority was located at P.M.T.C., Pt. Mugu. None were recorded at sea.

Elegant Tern (Thalasseus elegans)

Elegant Terns were considered quite rare in California north of Pt. Conception prior to 1950; since that time, small numbers have nested near San Diego, their northernmost and only U.S. nesting site (Gallup and Bailey 1960, Small 1974). The great majority of birds that reach California disperse northward in autumn from nesting colonies in Baja California. They travel as far as Monterey Bay in September (in fair numbers), but are scarce north of San Francisco (A.O.U. 1957). Southward migration to wintering grounds on the west coast of South America occurs in October and November. They return north in April to breed. Numbers of birds reaching southern California beaches in fall appear to vary from year to year (c.f. McCaskie 1968a, 1969a, 1970a).

There are only two Channel Is. records, both from San Clemente Is. (Jones in prep.); the species seems to be restricted to the sandy beaches, mudflats and tidal embayments of the mainland (Grinnell and Miller 1944, Small 1974). Little is known of the feeding habits of Elegant Terns, though it is presumed that they rely heavily on small, schooling fish captured by plunge-diving (Bent 1921).

1975-76 Baseline Data

April - May 1975. None were recorded on five mainland beaches.

June 1975. A few birds were recorded at San Diego Co. beaches (Table III-127), probably indicating the onset of dispersal from Mexican colonies. The immediate vicinity of the nesting colony at San Diego Bay was not censused nor was the success of that colony ascertained in 1975.

Elegant Tern (continued)

July 1975. Numbers at San Diego beaches swelled abruptly in July; none were seen to the north (Table III-127).

August 1975. Beach surveys in early August revealed a slightly smaller total of Elegant Terns at Border Field S.B. (Table III-127) and none elsewhere along the mainland. Our only sight record at sea was of two birds 15 km southeast of Pt. Dume, Ventura Co., on the 25th.

September 1975. Birds of this species appeared at beaches as far north as Ventura Co. in mid-month (Table III-127). San Diego beaches were not censused.

October 1975. Mainland counts increased over those of the previous month with a high count of 41 birds at Huntington S.B. (Table III-127). San Diego beaches were not censused.

November 1975. Numbers declined on mainland beaches, indicating the southward return of these birds. First counts of birds along the two southernmost beaches in three months revealed no Elegant Terns (Table III-127).

December 1975 - March 1976. None recorded.

Caspian Tern (Hydroprogne caspia)

This species is predominantly a resident of freshwater lakes and marshes, but also nests on the shores of quiet bays, estuaries and salt evaporation ponds throughout the length of California (Grinnell and Miller 1944). There are records of nesting colonies at San Diego Bay in recent years (Sams and Stott 1959). Apparently, Caspian Terns staged a recovery in California following persecution at the hands of millinery tradesmen early in this century, but reduction in availability of freshwater nesting habitat since the 1940's may have reduced populations once again (Grinnell and Miller 1944, Smail 1974). There is only one offshore record in southern California; the species prefers coastal lagoons, beaches, and estuaries (Small 1974).

Bent (1921) states that Caspian Terns feed upon small fish, shrimp, mussels, and the eggs and young of other birds. Gill (1976) reports that Caspian Terns nesting in south San Francisco Bay prey upon 21 species of estuarine and freshwater fishes.

1975-76 Baseline Data

April - June 1975. A few Caspian Terns were sighted at two San Diego Co. beaches in each month; none were recorded elsewhere (Table III-128).

July 1975. A total of 28 birds was recorded during mid-month beach surveys (Table III-128). The majority was found at McGrath S.B., with small numbers at P.MT.C., Pt. Mugu, and at Silver Strand S.B.

August 1975. Six birds were seen during beach censuses in early August (Table III-128); only P.M.T.C., Pt. Mugu had more than one bird.

September 1975. The highest yearly counts occurred in this month; almost 100 were seen at P.M.T.C., Pt. Mugu along (Table III-128). Two San Diego beaches were not censused. Our only record from the Channel Islands,

Caspian Tern (continued)

a single bird on Santa Cruz Is., was logged on the 13th.

October 1975. Five birds were seen, all at P.M.T.C., Pt. Mugu.

November 1975. None recorded.

December 1975. Our only records were of a single bird at P.M.T.C., Pt. Mugu and four at Huntington S.B.

January - February 1976. About two dozen birds appeared to overwinter at P.M.T.C., Pt. Mugu, the only beach at which we found Caspian Terns (Table III-128).

March 1976. Fifteen individuals recorded at P.M.T.C., Pt. Mugu, and 19 at Border Field S.B. in mid-March.

Common Murre (*Uria aalge*)

This large alcid is a boreal-low arctic species of three oceans. Eight subspecies are recognized, of which only one (*U. a. californica*) breeds in California (Tuck 1960, Udvardy 1963). Common Murres formerly nested south to San Miguel Is., but the southernmost colongy is presently at the Farallon Islands (Small 1974). Nests are on open ledges of sea cliffs on offshore rocks or islands (Tuck 1960). Colonies are often immense, with about 400,000 birds reported nesting on the Farallones in the mid-nineteenth century (Ainley and Lewis 1974) and some northern colonies numbering in the millions (Tuck 1960). Post-breeding dispersal as far south as San Diego takes place in October (Bent 1919).

The Common Murre is presently considered a winter visitor to southern California (Scott 1974), although a few birds summered there in 1973 (McCaskie 1974c). Recent records (McCaskie 1969-75) indicate the regular winter occurrence of Common Murres in low numbers south of Pt. Conception. Most records are of single individuals but with larger groups often reported, especially in eastern Santa Barbara Channel near Oxnard. The species generally occupies open ocean waters to 40 km offshore, with largest numbers within 20 km of the beach (Tuck 1960, Scott 1974). Most birds leave the Southern California Bight and move north by late May.

Common Murres feed primarily on midwater schooling fish and euphausiids (Scott 1974). Scott (1973) reported the major food item of these birds during the breeding season in Oregon to be the northern anchovy (*Engraulis mordax*) in addition to herring and smelt. Cody (1973) listed the following food items from the Olympic Peninsula in order of importance: smelt (*Hypomesus*), anchovy, sand lance (*Ammodytes*), and

seabass (Sebastes); he also recorded a single instance of feeding on an unidentified flatfish. Tuck (1960) found the polar cod (*Boreogadus saida*) to be the most important fish in the diet of murres in colder waters, although their food sources appeared to be whatever small fish were locally present; macroplankton was felt to be important to adult birds only in the summer months.

Mass mortality in Common Murres has been reported by Tuck (1960), and Bailey and Davenport (1972), among others. Such murre wrecks often occur during or just after periods of stormy weather which probably disrupt feeding and blow the birds away from food concentrations. One such incident probably killed over 100,000 birds on the Alaskan Peninsula (Bailey and Davenport 1972). Mortality factors at the breeding colonies include: 1) egg losses due to falling or collecting (Tuck 1960); 2) chick losses from exposure, their falling off ledges or into cracks, and gull and raptor predation; and 3) disease. Several murre colonies have been decimated by the activities of commercial egging operations over the past two centuries (Tuck 1960). Over 45 million murre eggs were taken from the Farallon Islands during the last half of the 19th century, during which time the breeding population on the island dropped from about 400,000 to 60,000 (Ainley and Lewis 1974). Since murres are diving birds that live in shallow continental shelf areas, losses from oil pollution each year are considerable (Tuck 1960, Bourne 1968, Clark 1973, Smail et al, 1974, Vermeer and Anweiler 1975). Seasonal die-offs (July-September) may also occur regularly within the northern California population (Bodle 1969).

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are discussed on p. III-628.

1975-76 Baseline Data

April - October 1975. None recorded.

November 1975. Only five Common Murres were seen on this month's ship surveys: one 7.5 km south of Gull Is., one 15 km south of Pt. Dume, two birds 3.7 km south of Pt. Vicente, and one in the outer Santa Barbara Passage.

December 1975. Common Murres were seen in low to moderate numbers in the northern half of the study area, particularly between Anacapa Is. and Pt. Dume (Fig III-A4-347). In addition, three birds were seen at the south end of San Miguel Passage, one 2 km south of Pt. Vicente and two more 18 km south of Dana Pt. in the Gulf of Santa Catalina.

January 1976. The number of murres present in the Bight had increased over the previous month. Moderate to moderately high concentrations were encountered south of Santa Cruz Is. west to Rodriguez Seamount and in central and eastern Santa Barbara Channel. They were also common in Santa Monica Bay northwest to Pt. Dume (Figs. III-A4-348, 349). In the south, one bird was sighted 10 km east of Santa Barbara Is. and another near Fortymile Bank.

February 1976. Ship sightings totaled 10 birds: three at the south end of Santa Cruz Channel, two at the south end of Anacapa Passage, four birds between 20 and 35 km southeast of Anacapa Is., and a single bird among a mixed inshore feeding flock of gulls and cormorants on the north side of Santa Catalina Is. No flights were made this month, so Santa

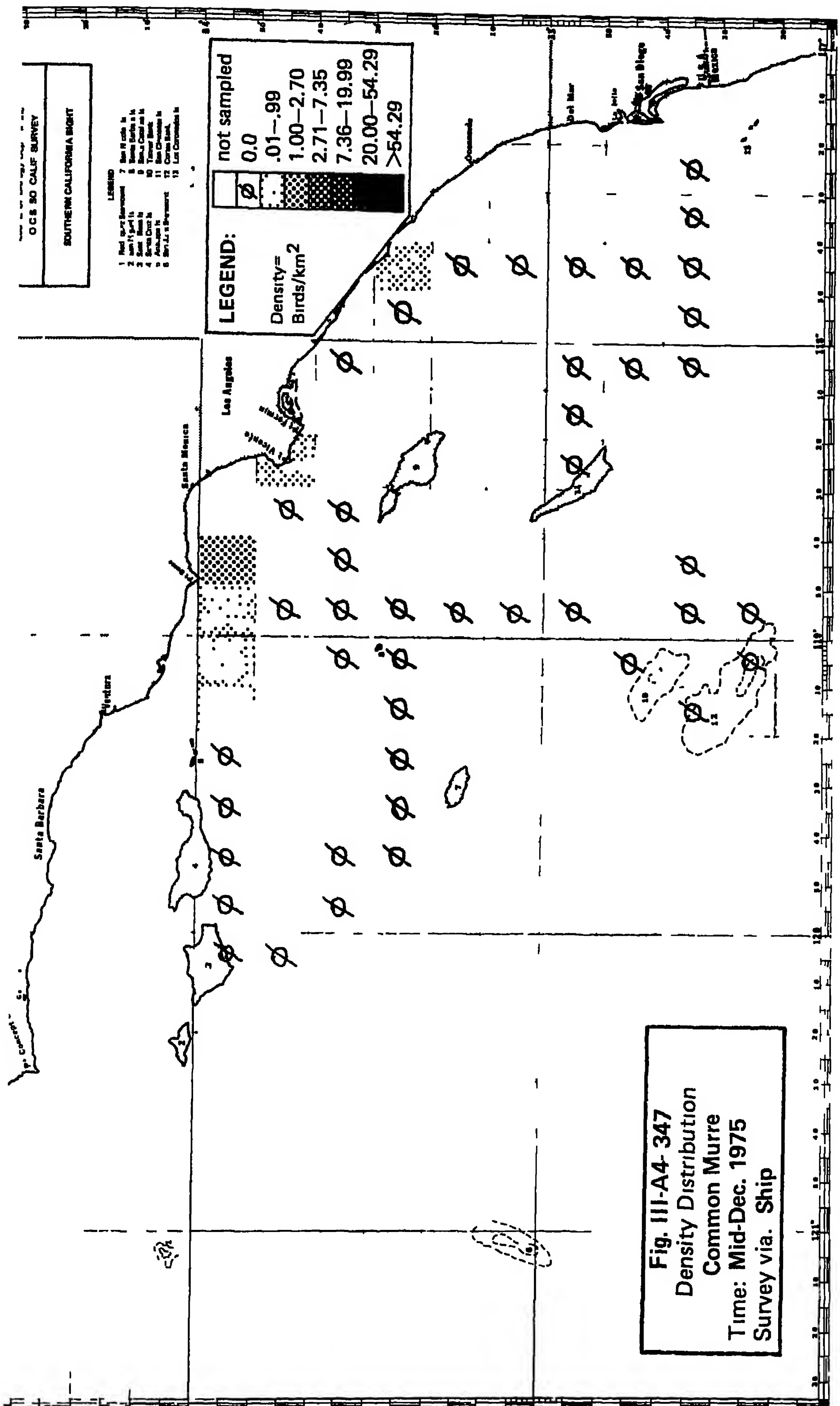


Fig. III-A4-347
Density Distribution
Common Murre
Time: Mid-Dec. 1975
Survey via. Ship

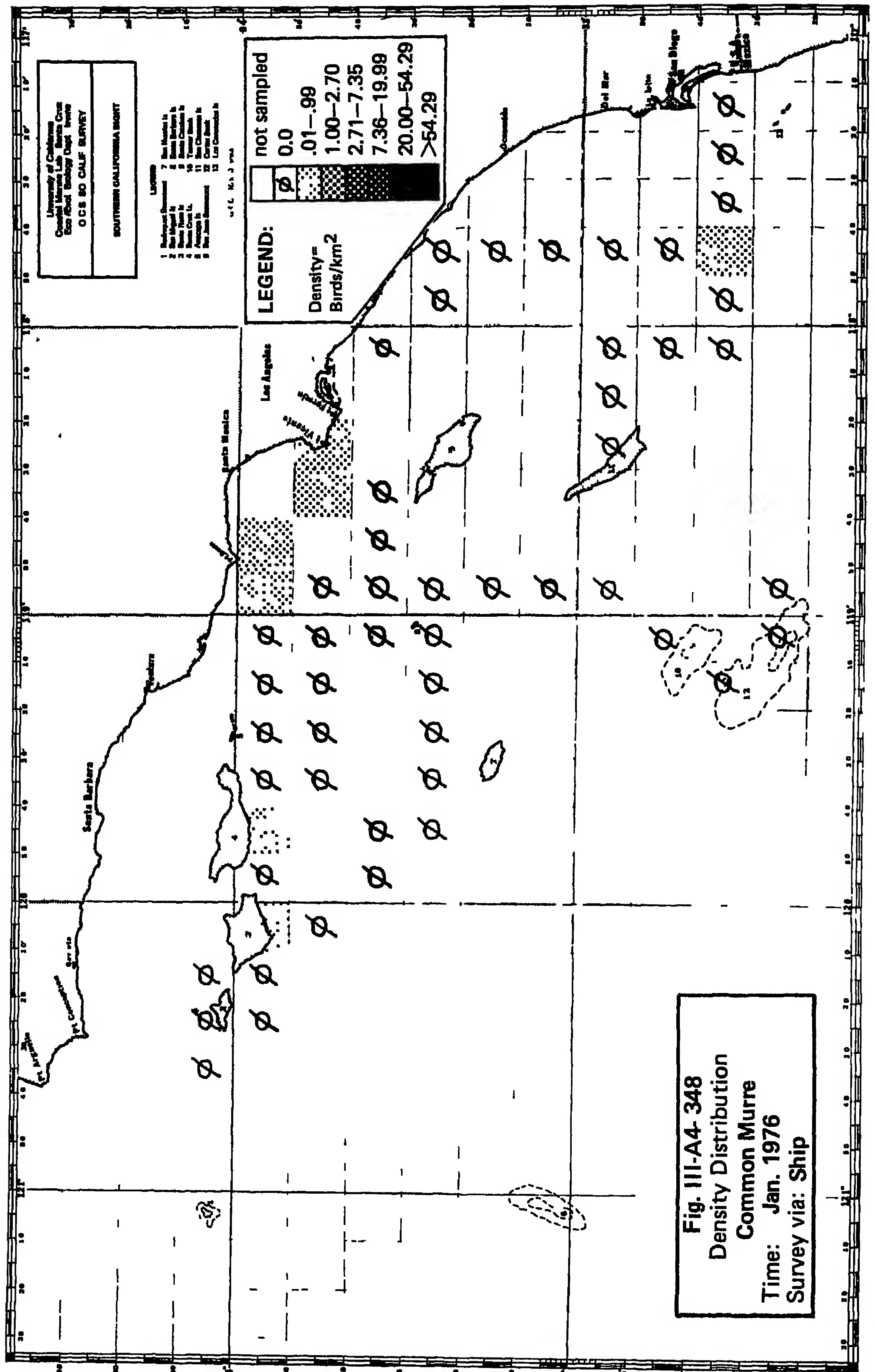


Fig. III-A4-348
Density Distribution
Common Murre
Time: Jan. 1976
Survey via: Ship

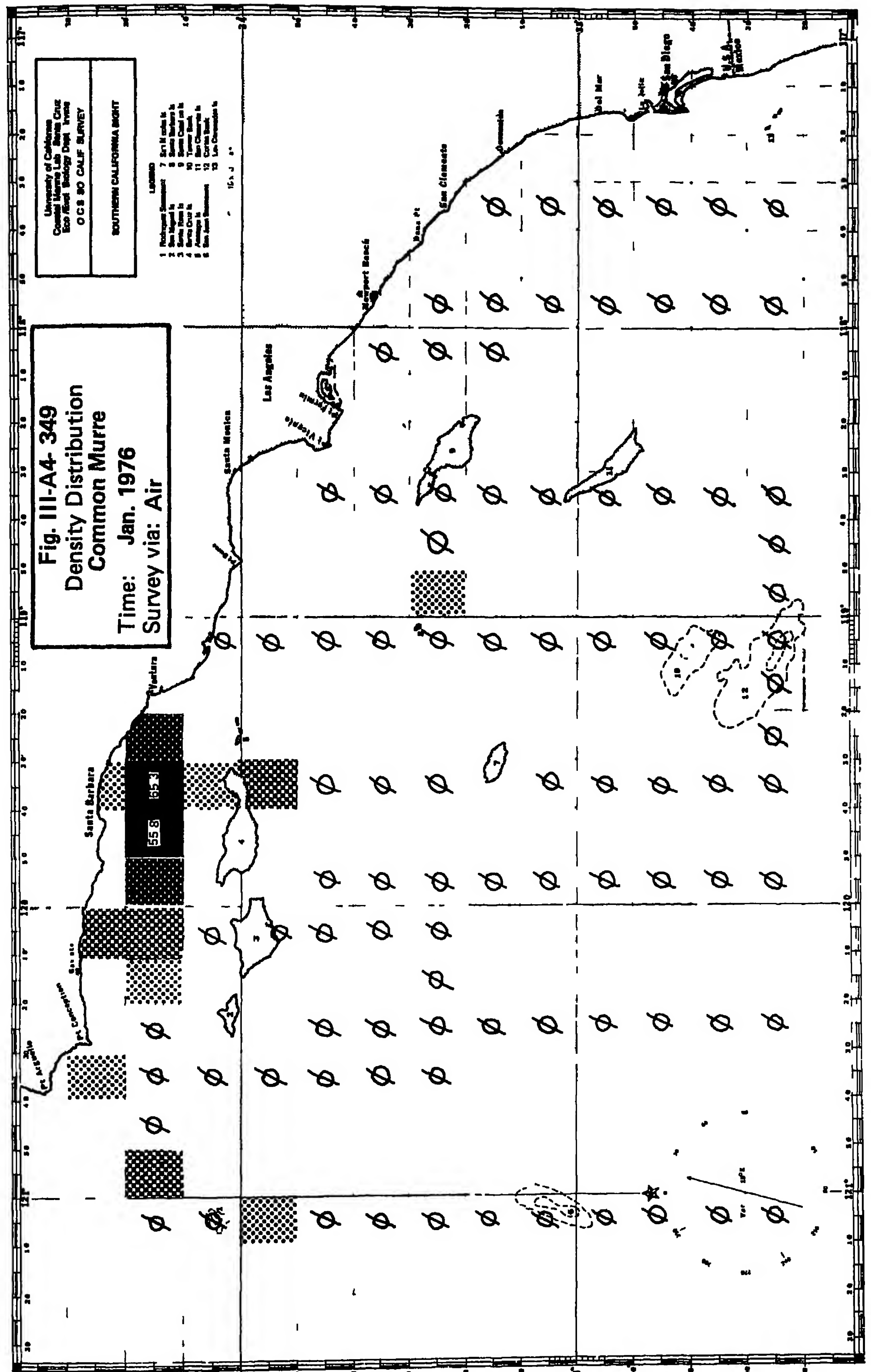
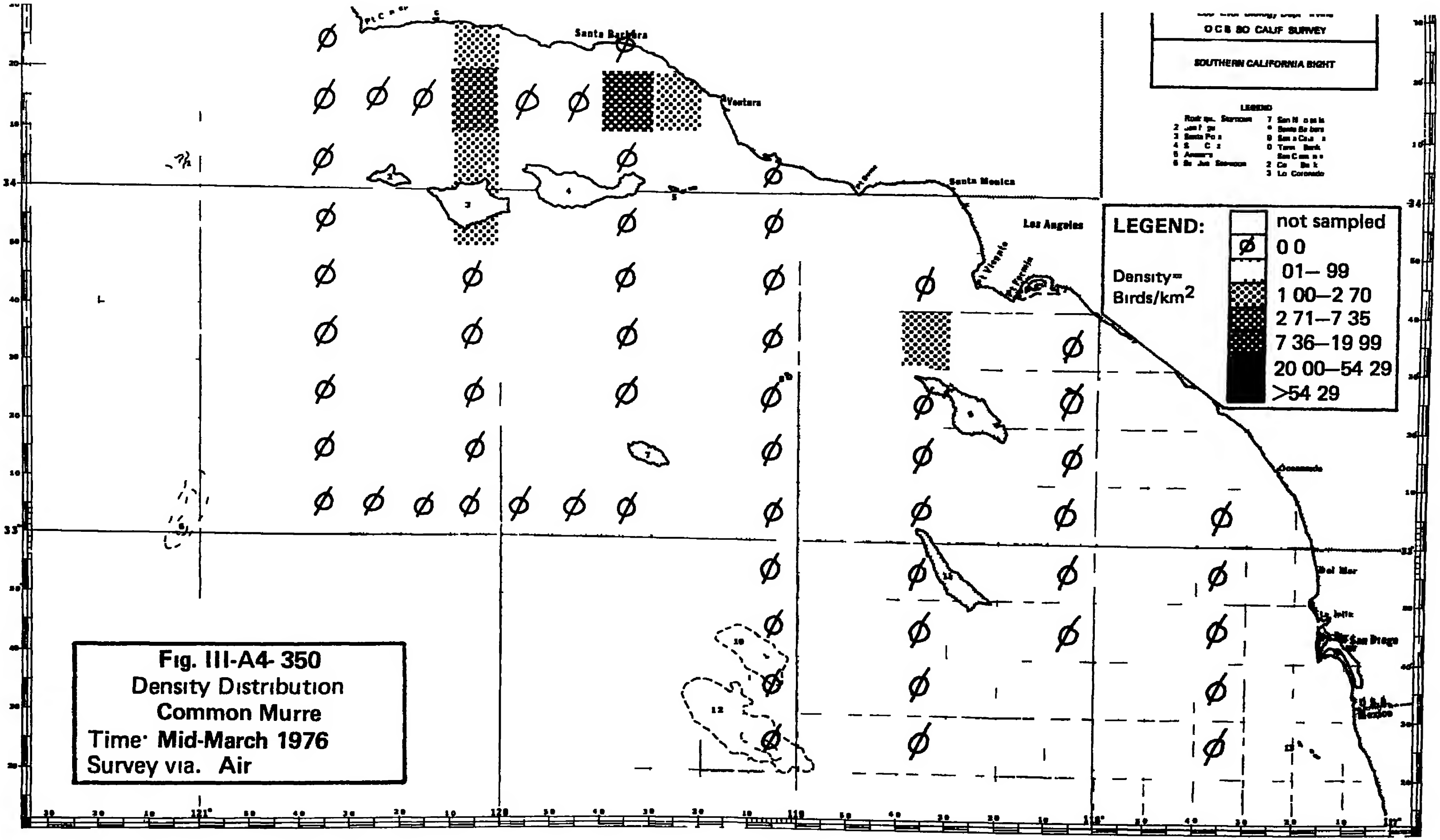


Fig. III-A4-349
Density Distribution
Common Murre
Time: Jan. 1976
Survey via: Air

Barbara Channel was not surveyed.

March 1976. Moderate densities of these birds were encountered in eastern Santa Barbara Channel, immediately south of Santa Rosa Is. and north of Santa Cruz Is., at the south end of Santa Cruz Channel and at the north end of Santa Catalina Is. (Fig. III-A4-350). Smaller numbers were also found in San Miguel and Anacapa Passages.



OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
Santa Barbara
Ventura
Santa Monica
Los Angeles
Oceanside
Del Mar
La Jolla
San Diego
LEGEND:
Density=
Birds/km2
not sampled
0 0
01— 99
1 00—2 70
2 71—7 35
7 36—19 99
20 00—54 29
>54 29
Fig. III-A4- 350
Density Distribution
Common Murre
Time: Mid-March 1976
Survey via. Air

Pigeon Guillemot (*Cepphus columba*)

The Pigeon Guillemot is a common breeding species of the North Pacific Ocean and the Bering Sea. Of the two subspecies (*C. c. columba* and *C. c. kaiurka*), only the former ranges into California waters (Grinnell and Miller 1944). These birds are not distinctly colonial but breed in small groups or scattered pairs within caverns of seacliffs, crevices, or in spaces between boulders near the tide line (Bent 1919, Grinnell and Miller 1944, Gabrielson and Lincoln 1959, Drent 1965, Cody 1973, Scott 1974). Some nest sites may be over 60 m above the water, and some excavation of burrows has been reported (Dawson and Bowles 1909, Scott 1974). Two eggs are laid on a collection of small rock chips or pebbles (Bent 1919, Gabrielson and Lincoln 1959). Post-breeding migration is limited to offshore dispersal in the breeding area (Bent 1919, Gabrielson and Lincoln 1959).

In southern California, Pigeon Guillemots breed on the northern Channel Islands and on Santa Barbara Is. Most sightings occur near shore in the immediate vicinity of the breeding islands or island passages during the months of February through August. It is not known where local populations spend the winter. Only a single winter record (from Santa Catalina Is. in December 1897) exists for southern California (Grinnell 1898). Spring migration is apparently limited to a return to breeding sites from the nearby sea (Bent 1919).

Food habits of Pigeon Guillemots have been studied recently in Washington by Thoresen and Booth (1958) and by Drent (1965), and in California by Follet and Ainley (1976). Guillemots were found to be feeding on blennies (Blenniidae), kelpfish (Clinidae), sculpin

(Cottidae), flatfish, sand lance (Ammodytes), and smelt (Osmeridae) in the northern area. Follett and Ainley (1976) found mainly rockfish (Scorpaenidae), sculpins (Cottidae), and poachers (Agonidae) among the 24 species recovered near guillemot nests on the Farallons. Most fishes encountered were benthic or epibenthic forms, suggesting that foraging by guillemots occurs principally in relatively shallow water (Drent 1965, Follett and Ainley 1976). Crustaceans and molluscs have also been reported as food items for this species (Bent 1919, Scott 1974).

Guillemots suffer much less from gull depredation than do murres since their eggs are usually better concealed (Bent 1919, Gabrielson and Lincoln 1959). Heath (in Bent 1919) found regular depredation upon the guillemots of Forrester Is., Alaska by crows.

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are contained in pp. III-519-534.

1975-76 Baseline Data

April 1975. The only sighting was a single bird 7.5 km southwest of Santa Barbara Is.

May 1975. Although Pigeon Guillemots were undoubtedly present at breeding sites on the four northern islands and on Santa Barbara Is., at-sea surveys recorded them only from San Miguel, Santa Cruz and Santa Barbara Islands. (See Table III-115 of this report for breeding colony censuses.) At San Miguel Is., densities of 1.26/km^2 and 3.24/km^2

were encountered near Prince Is. and Castle Rk., respectively. Two birds were sighted at Fraser Pt., Santa Cruz Is. during beach surveys there. Numerous Pigeon Guillemots were recorded near Santa Barbara Is. this month, with densities of 2.70/km^2 recorded 1.85-3.70km northwest of the island.

June 1975. None were found at sea; however, five birds were sighted close inshore at the west end of Santa Cruz Is. and fifty along the north side of West Anacapa Is. (Table III-A4-186).

July 1975. Pigeon Guillemots were found within two miles of the south shoreline of Santa Rosa Is. between Ford Pt. and Johnson's Lee and in the vicinity of Brockway and Carrington Points, along the north side of Santa Cruz Is. and at Anacapa Is. (Table III-A4-186).

August 1975. One guillemot was recorded at the north end of Santa Cruz Channel. Inshore surveys found moderate numbers of guillemots near Prince Is. and Pt. Bennett on San Miguel Is., low numbers at the west end of Santa Cruz Is., and at Santa Barbara and Santa Catalina Islands.

September 1975 - January 1976. None recorded.

February 1976. Three Pigeon Guillemots were seen during extensive inshore surveys of San Miguel Is. Two birds were sighted near Prince Is., and one between Crook Pt. and Cardwell Pt. The Crook/Cardwell bird and one of the Prince Is. birds were in winter plumage, the only guillemots so recorded during our 1975-76 surveys.

March 1976. Pigeon Guillemots returned to the vicinity of breeding sites in moderate to large numbers this month. Densities of 1.08/km^2 were recorded around Prince Is., San Miguel Is., and 4.50 birds/km^2

Table III-A4-186.

Frequency of sightings of Pigeon Guillemots (total individuals) on and near Channel Island beaches, April 1975 through March 1976. Numbers in parentheses refer to specific locations on Figures III-178 through -185. Dash indicates area not surveyed or survey incomplete.

Location / Date→ / Type→	13-15 May 75 Ship	16-20 Jun 75 Ship	27-30 Jun 75 Air	14-18 Jul 75 Ship	4-7 Aug 75 Air	11-14 Feb 76 Ship	12-14 Mar 76 Air	16-22 Mar 76 Ship
SAN MIGUEL IS.								
Richardson Rk. (103)	0	-	0	-	0	-	0	-
West (102,110-20,160,170)	0	-	0	0	0	0	0	0
South (146-51)	0	0	0	0	6	1	0	0
East (101,140-45)	0	0	12	0	21	2	0	2
North (121-40)	35	0	2	0	0	0	0	0
SANTA ROSA IS.								
West (611-12,625)	-	-	4	-	0	-	0	0
South (620-24)	0	0	0	0	0	-	0	16
East (618-19,629)	-	0	0	0	0	0	0	0
North (610,613-17)	-	-	0	28	0	-	0	0
SANTA CRUZ IS.								
West (641,658)	-	0	0	-	1	-	0	0
South (650,653-56)	-	5	0	-	0	0	0	2
East (649,651)	-	0	0	4	0	-	0	-
North (640,643-48)	-	-	0	24	0	-	12	-
ANACAPA IS. (660-80)	-	0	50	8	-	0	-	2
SAN NICOLAS IS.								
Northwest (210-60)	-	-	0	-	0	-	0	-
Southwest (203)	-	-	0	-	0	-	0	-
Southeast (202)	-	-	0	-	0	-	0	-
Northeast (201)	-	-	0	-	0	-	0	-
SANTA BARBARA IS. (300-330)	-	0	0	0	2	0	0	17
SANTA CATALINA IS.								
Northwest (506-07,515, 525-27)	-	-	0	-	3		-	-
Southwest (503-05,529)	-	-	0	-	0	-	-	-
South (502,523-24)	-	-	0	-	0	-	-	-
East (501,509-11)	-	-	0	-	0		-	-
Isthmus (508,521-522)	-	-	0	-	0		-	-
SAN CLEMENTE IS.								
Northwest (409-11)	-	-	0	0	0	-	0	-
West Central (406-08)	-	-	0	0	0	-	0	-
Southwest 404-05)	-	-	0	-	0	-	0	-
Pyramid Cove (402-03)	-	-	0	-	-	-	-	-
East 401,412)	-	-	0	-	-	-	-	-

Pigeon Guillemot (continued)

were encountered in northern San Miguel Passage. Two birds were seen at the north end of Santa Cruz Channel. They were common on the north and south shores of Santa Cruz Is., south of Santa Rosa Is., and at Anacapa and Santa Barbara Islands as well.

Craveri's Murrelet (Endomychura craveri)

Craveri's Murrelets are described as uncommon and irregular post-breeding visitors along the southern California coast.

These murrelets breed on the islands of the Gulf of California, and probably on some islands along the west coast of Baja California, (Jehl and Bond 1975, DeWeese and Anderson 1976). Eggs are laid in rocky holes and crevices. At the conclusion of the breeding season some birds undergo an irregular northward dispersal along the Pacific coast, in rare instances as far as Monterey (Jehl and Bond 1975) and Oregon (Jehl 1975).

Little is known of the feeding habits of this species. DeWeese and Anderson (1976) examined the stomachs of five Craveri's Murrelets taken in the Gulf of California in 1971 and found that the birds "feed mostly on larval fishes and small adult pelagic fishes at or near the surface, over deep water; a limited number of invertebrates are also taken."

Throughout the historical record, Craveri's Murrelet is recorded as present in the waters of the Southern California Bight in late summer-early fall (August-September) (Howell 1917, Bent 1919, Willett 1933, Grinnell and Miller 1944, DeWeese and Anderson 1976). Seasonality, size and distribution of the visiting population are poorly known however. This uncertainty primarily reflects the identification problems encountered in separating this species from Xantus' Murrelet (Endomychura hypoleuca). For all months except August and September, our records of "murrelet sp." are assumed to be Xantus' Murrelets, and they are included in the account of that species. Unidentified murrelet records for August and September could pertain to

either species and are included below.

1975-76 Baseline Data

April - July 1975. None recorded.

August 1975. Early in August, pairs of murrelets were recorded at the east end of Santa Barbara Channel, and 40-50 km southwest of San Nicolas Is. on the western flank of the Santa Rosa-Cortés Ridge. Late in the month a single bird was observed 10-20 km east of Fortymile Bank.

September 1975. Mid-September records of unidentified murrelets (one or two birds) exist for the following sites: 15-20 km east of Rodriguez Seamount, 10 km south of San Miguel Is., 2-5 km southeast of Santa Rosa Is., 15-20 km southeast of Santa Barbara Is., and within 10 km of the northwest end of Cortés Bank (two records). Late September records of unidentified murrelets (one or two birds) exist for the following areas: the east side of Tanner Bank, the central Gulf of Santa Catalina, and 25-50 km due west of San Diego (two records).

Xantus' Murrelet (<u>Endomychura hypoleuca</u>)

This is the only murrelet that breeds in southern California. Jehl and Bond (1975) have recently reviewed the taxonomy and distribution of this species and the closely related Craveri's Murrelet (<u>E</u>. <u>craveri</u>). Two subspecies (<u>E</u>. <u>h</u>. <u>hypoleuca</u> and <u>E</u>. <u>h</u>. <u>scrippsi</u>) are recognized; the southern form (<u>E</u>. <u>h</u>. <u>hypoleuca</u>) breeds on Guadalupe Is., Baja California, and presumably on the San Benitos Islands. The northern form (<u>E</u>. <u>h</u>. <u>scrippsi</u>) breeds on several of the California Channel Islands from Prince Is. south to the San Benitos Islands where is intergrades with <u>E</u>. <u>h</u>. <u>hypoleuca</u>. Both subspecies have been collected as far north as Washington.

Nests are in deep crannies, between rocks or boulders, or in shallow hollows scratched in loam under dense shrubbery, from close to the high water mark to the tops if the islands (Howell 1917, Bent 1919). In southern California, Xantus' Murrelets are commonly observed in the open ocean, frequenting more inshore waters in spring and summer as they concentrate around island breeding sites, then moving well offshore during the winter months (Scott 1974). They are often seen in pairs.

Little is known of the food of Xantus' Murrelets. Howell (in Bent 1919) speculated that they probably feed on small crustaceans; he doubted they were fish eaters. DeWeese and Anderson, however, found the closely related Craveri's Murrelet to feed on small fish.

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are contained in pp. III-516-535.

Xantus' Murrelet (continued)

1975-76 Baseline Data

Note: Because of the difficulties in distinguishing between Xantus' and closely related Craveri's Murrelet, a large proportion of murrelet sightings were entered into field data logs as "murrelet sp." Based on the present knowledge of the distribution of these two species, we have assigned all unspecified murrelet sightings to Xantus' Murrelet, E. hypoleuca, except those sightings made during the months of August and September. During those months, unspecified murrelet sightings have been referred to Xantus'/Craveri's Murrelet.

April 1975. Moderate to high densities of Xantus' Murrelets were observed around Santa Barbara Is. and between that island and San Nicolas Is. (Fig. III-A4-351).

May 1975. Ship surveys found moderate to high densities of Xantus' Murrelets near Richardson Rk., San Miguel Is., along the south sides of the northern islands chain, and around Santa Barbara Is. (Fig. III-A4-352). Aerial surveys found murrelets in moderately high numbers in the vicinity of Fortymile Bank southeast of San Clemente Is. Numbers seen tapered from there north to Lasuen Knoll where two birds were seen (Fig. III-A4-353).

June 1975. Low to moderate numbers of murrelets were seen along the northern Santa Rosa-Cortés Ridge, at the north end of Santa Cruz Channel, in Santa Barbara Channel, near Santa Barbara Is. (Fig. III-A4-354) and at Tanner Bank. The species was again common near Fortymile Bank as well.

July 1975. Xantus' Murrelet sightings were concentrated along the northern Santa Rosa-Cortés Ridge (Fig. III-A4-355), where low to moderate

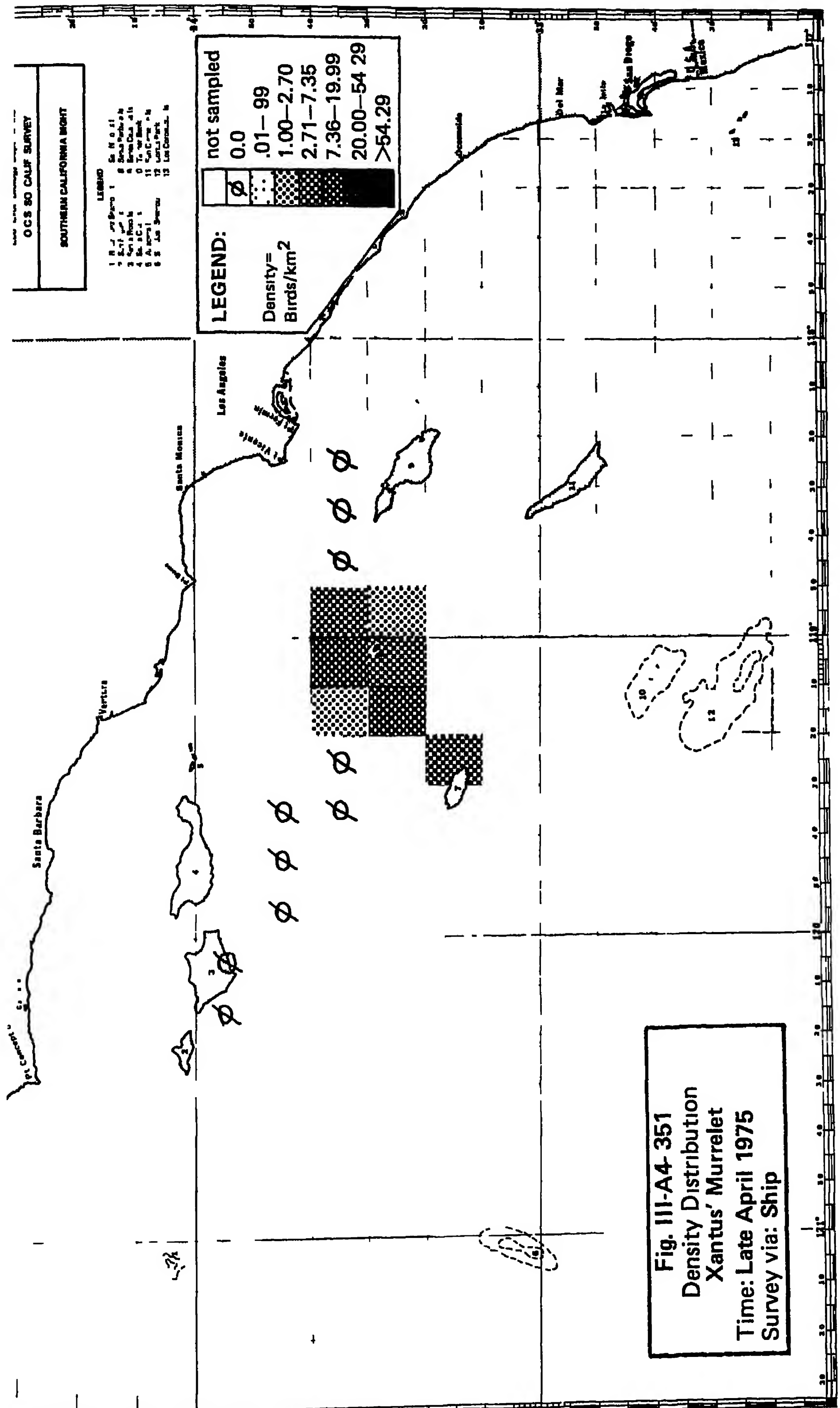


Fig. III-A4-351
Density Distribution
Xantus' Murrelet
Time: Late April 1975
Survey via: Ship

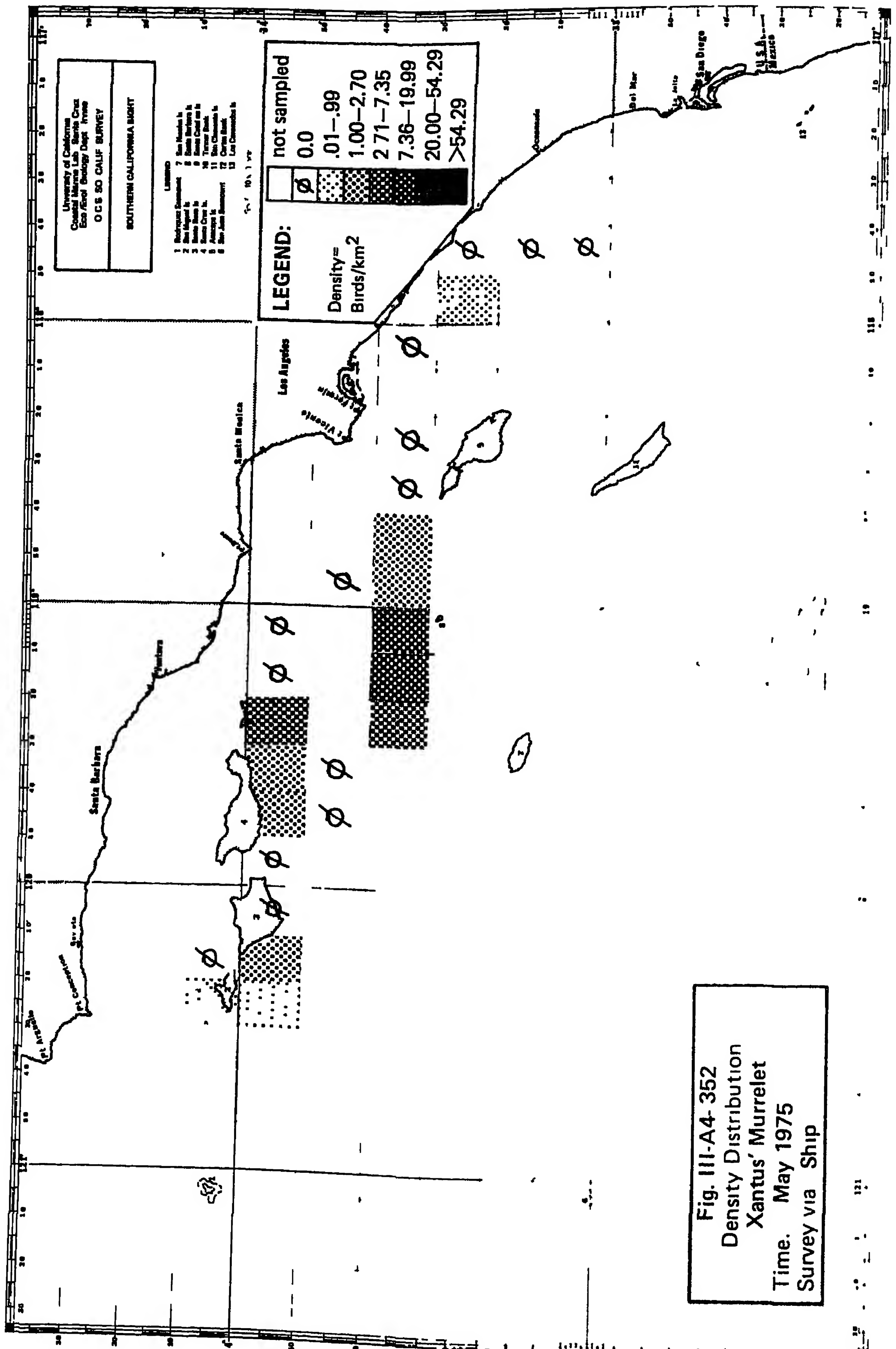


Fig. III-A4-352
Density Distribution
Xantus' Murrelet
Time. May 1975
Survey via Ship

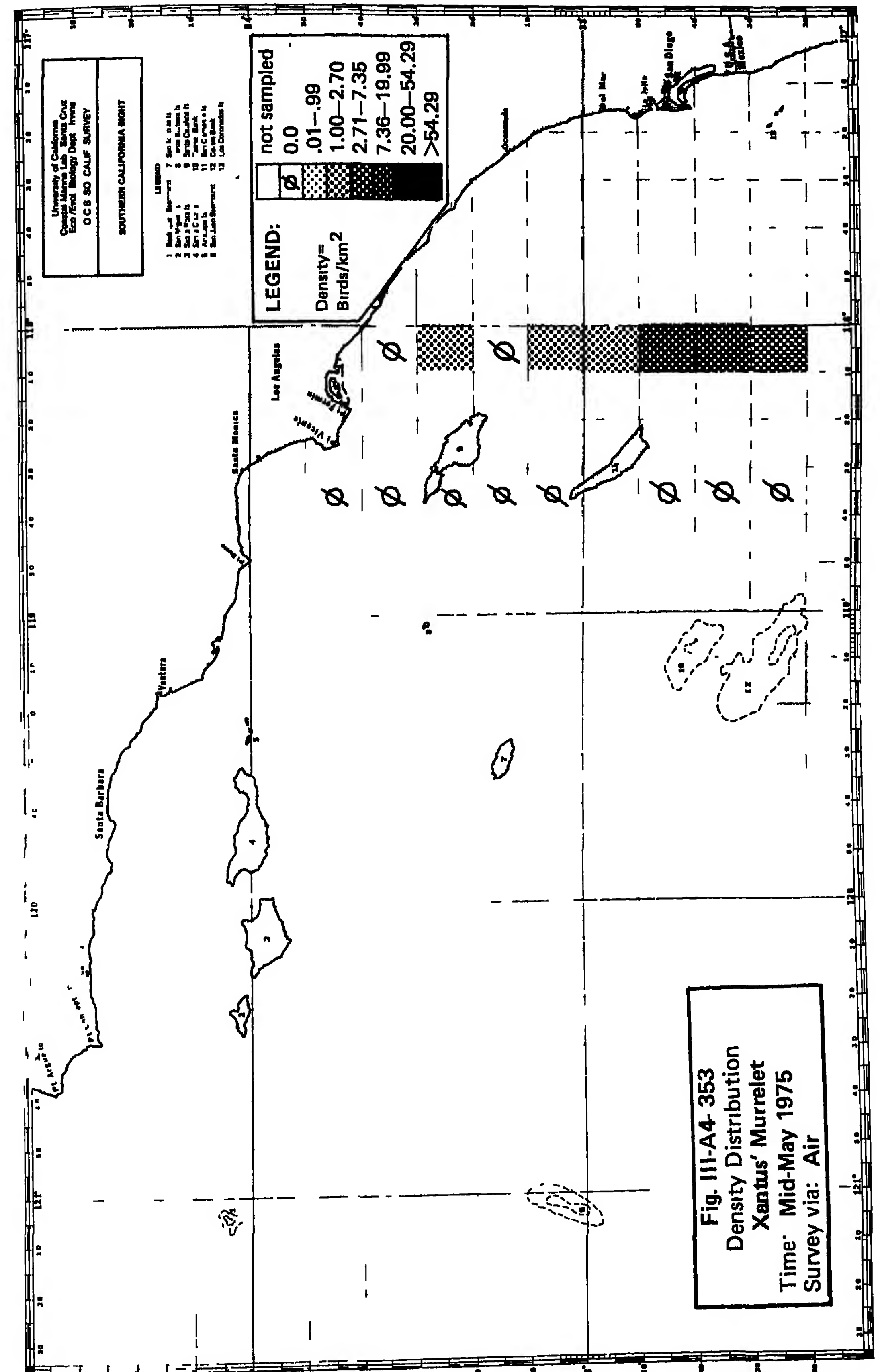


Fig. III-A4-353
Density Distribution
Xantus' Murrelet
Time: Mid-May 1975
Survey via: Air

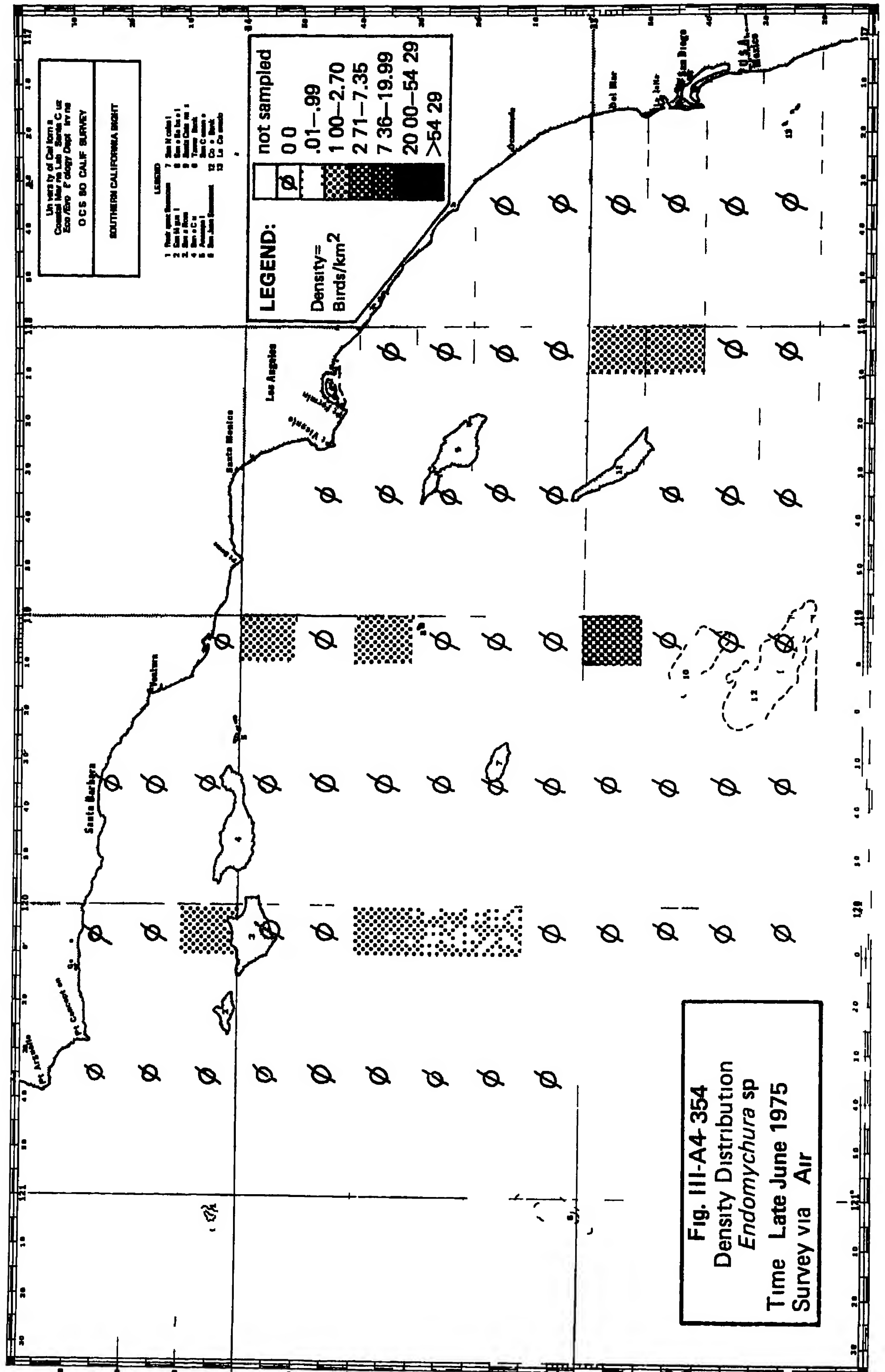


Fig. III-A4-354
Density Distribution
Endomychura sp
Time Late June 1975
Survey via Air

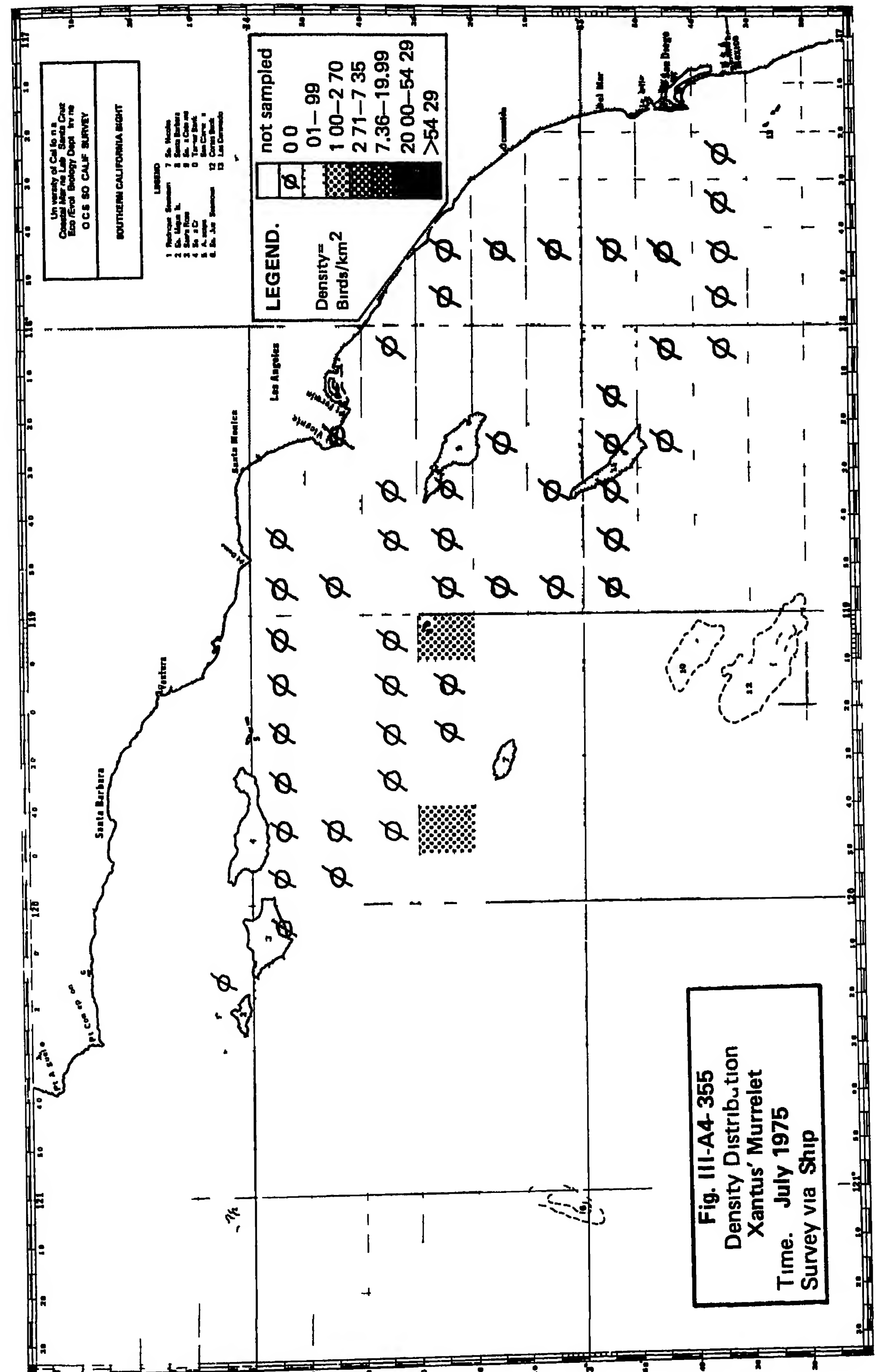


Fig. III-A4-355
Density Distribution
Xantus' Murrelet
Time. July 1975
Survey via Ship

numbers were seen. Other birds were seen around Santa Barbara Is., near Pt. Vicente, and north and east of San Clemente Is.

August 1975. No positive sightings of Xantus' Murrelets were made during this month, and only four unidentified murrelets were seen. Shipboard sightings accounted for only a single murrelet, 15 km southeast of Fortymile Bank. Three more birds were seen from the aircraft; two at the east end of Santa Barbara Channel, and one 65 km southwest of San Nicolas Is.

September 1975. Positively identified Xantus' Murrelets were seen only in the vicinity of Tanner Bank where several Xantus'/Craveri's Murrelets were found (Fig. III-A4-356). Xantus'/Craveri's Murrelets were also observed near Rodriguez Seamount, immediately south of Santa Rosa and San Miguel Islands, 18 km southeast of San Nicolas Is., and 18 km north and 35-50 km southeast of Fortymile Bank.

October 1975. Only one sighting of a single Xantus'/Craveri's Murrelet, 18 miles off La Jolla, was made from the air this month.

November 1975. One sighting was made of two birds 20 km northeast of Santa Barbara Is.

December 1975. Six murrelets were seen during ship and aerial surveys this month. Aerial surveys found a single murrelet within 18 km northeast of Santa Barbara Is. Standard ship surveys found five birds, located as follows: a single bird 4 km south of Ford Pt., Santa Rosa Is.; two birds 9 km south of Pt. Dume; and two more birds 18 km southeast of Fortymile Bank.

January 1976. Presumed Xantus' Murrelets were found to be concentrated

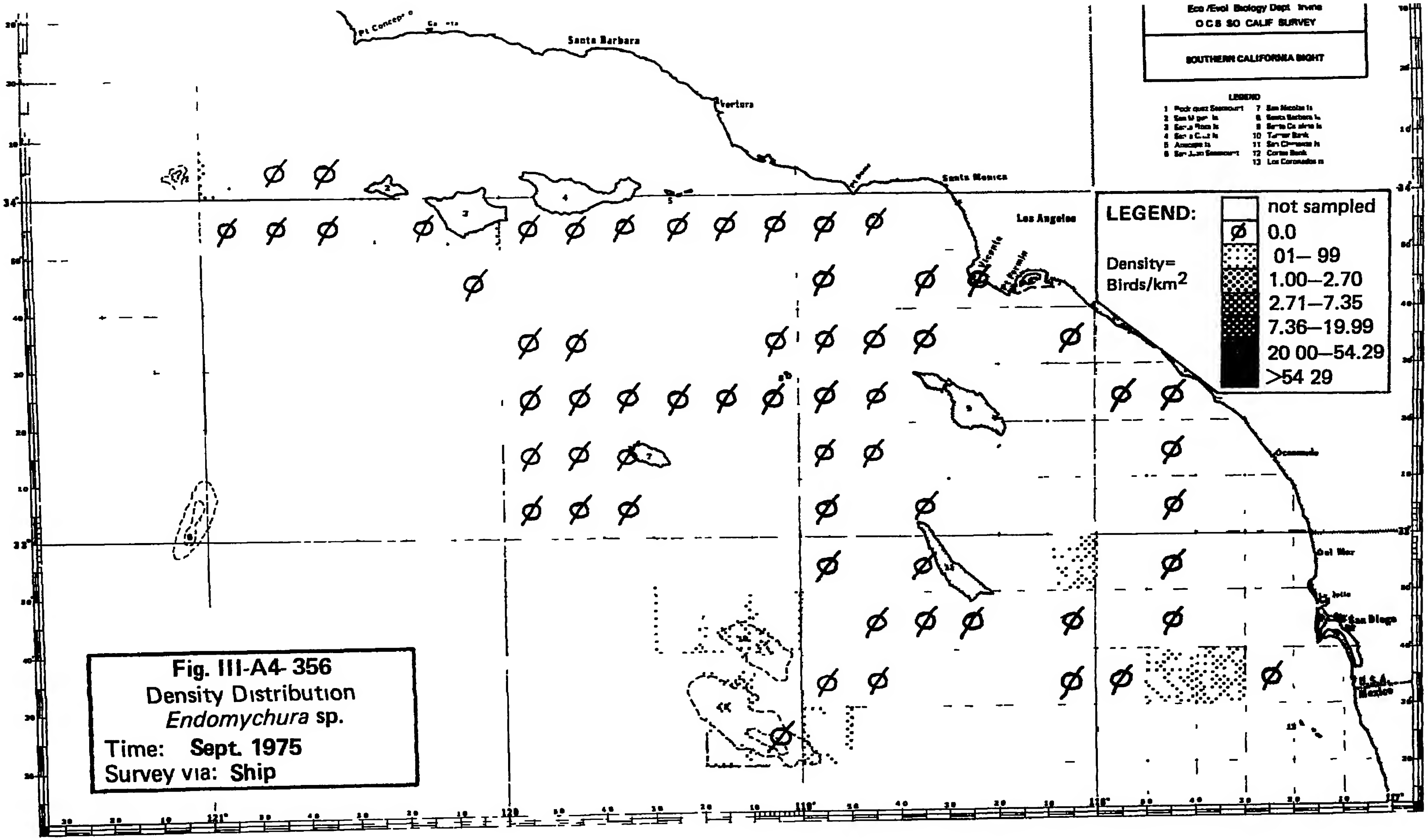


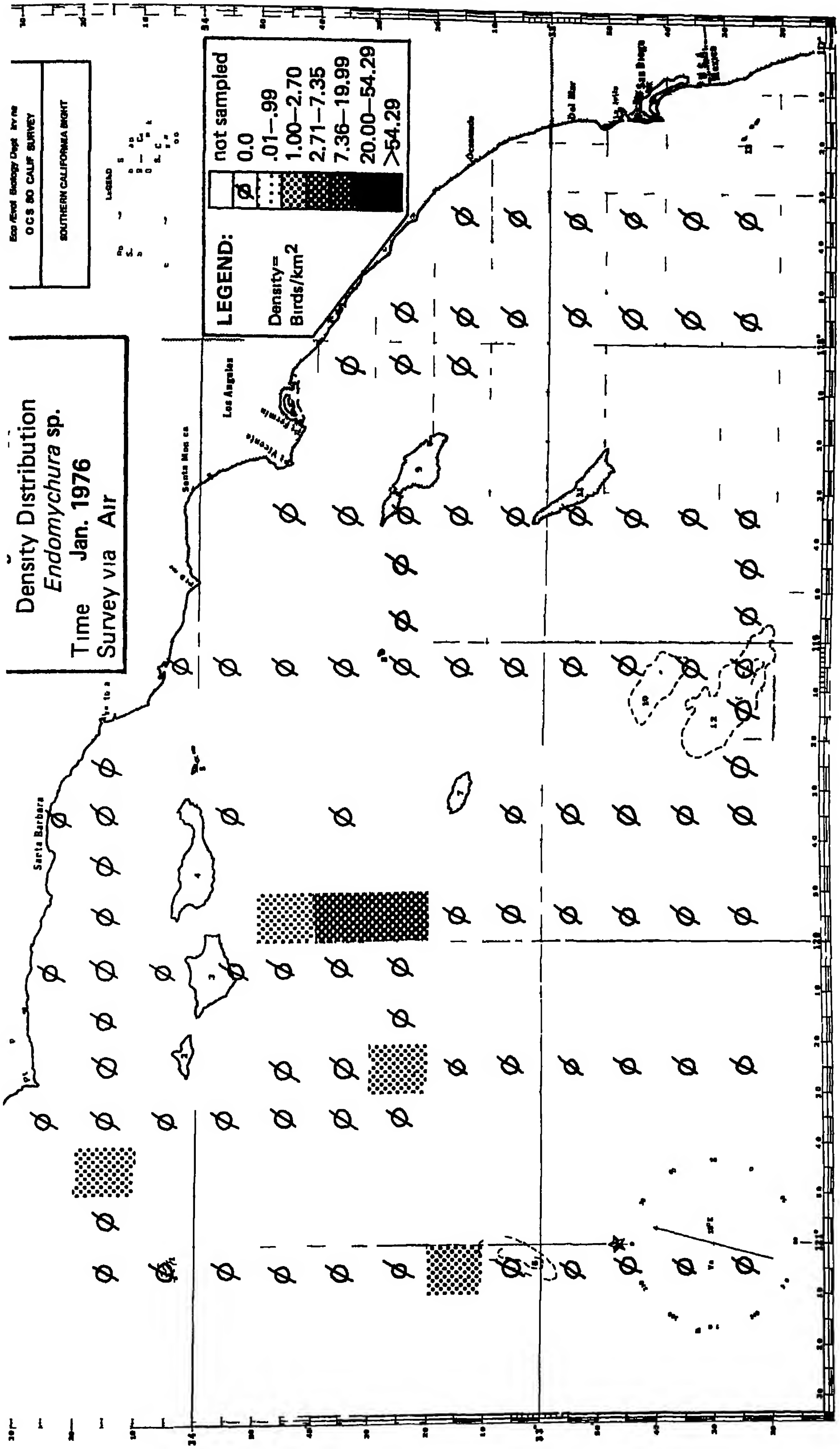
Fig. III-A4- 356
Density Distribution
Endomychura sp.
Time: **Sept. 1975**
Survey via: **Ship**

Xantus' Murrelet (continued)

along the northern Santa Rosa-Cortés Ridge, with scattered sightings northwest of San Miguel Is., and offshore in the vicinity of San Juan Seamount (Fig. III-A4-357). Murrelets were also common in Santa Cruz Basin (Fig. III-A4-358), and two birds were seen at the entrance to San Diego Harbor.

February 1976. Ship surveys found a single murrelet near Gull Is., but most were located in the southern vicinity of Santa Barbara Is., apparently reflecting a return to breeding sites there (Fig. III-A4-359).

March 1976. Xantus' Murrelets were seen in low numbers at a few widely scattered locations within the Bight (Fig. III-A4-360). Sightings of two birds each were made immediately south of East Pt., Santa Rosa Is. and at the north end of Anacapa Passage. Moderate numbers were also encountered immediately south and east of Anacapa Is. Single birds were seen 35 km southeast of Santa Catalina Is., and on the Patton Escarpment 55 km northeast of San Juan Seamount. Ship surveys found Xantus' Murrelets concentrating near their known breeding colonies at Santa Barbara Is., Prince Is. and Gull Is. (Fig. III-A4-361). Three birds were also sighted 18 km west of Los Coronados.


Density Distribution
Endomychura sp.
Time Jan. 1976
Survey via Air
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
Santa Barbara
Santa Monica
Los Angeles
Oceanside
Del Mar
San Diego

Xantus' Murrelet (continued)

along the northern Santa Rosa-Cortés Ridge, with scattered sightings northwest of San Miguel Is., and offshore in the vicinity of San Juan Seamount (Fig. III-A4-357). Murrelets were also common in Santa Cruz Basin (Fig. III-A4-358), and two birds were seen at the entrance to San Diego Harbor.

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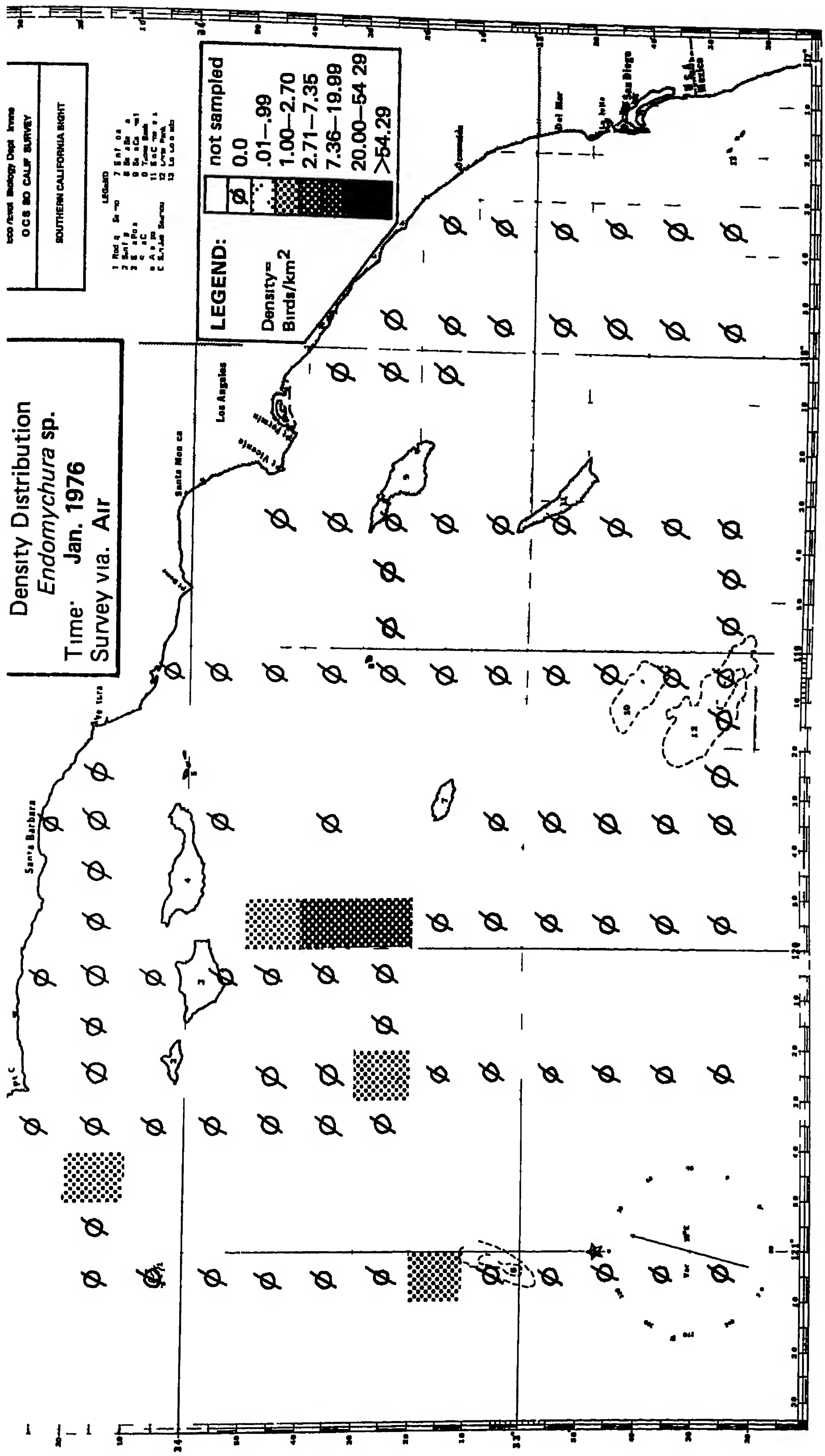

Density Distribution
Endomychura sp.
Time: Jan. 1976
Survey via. Air
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01–.99
1.00–2.70
2.71–7.35
7.36–19.99
20.00–54.29
>54.29
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
Los Angeles
Santa Barbara
Santa Monica
Del Mar
San Diego

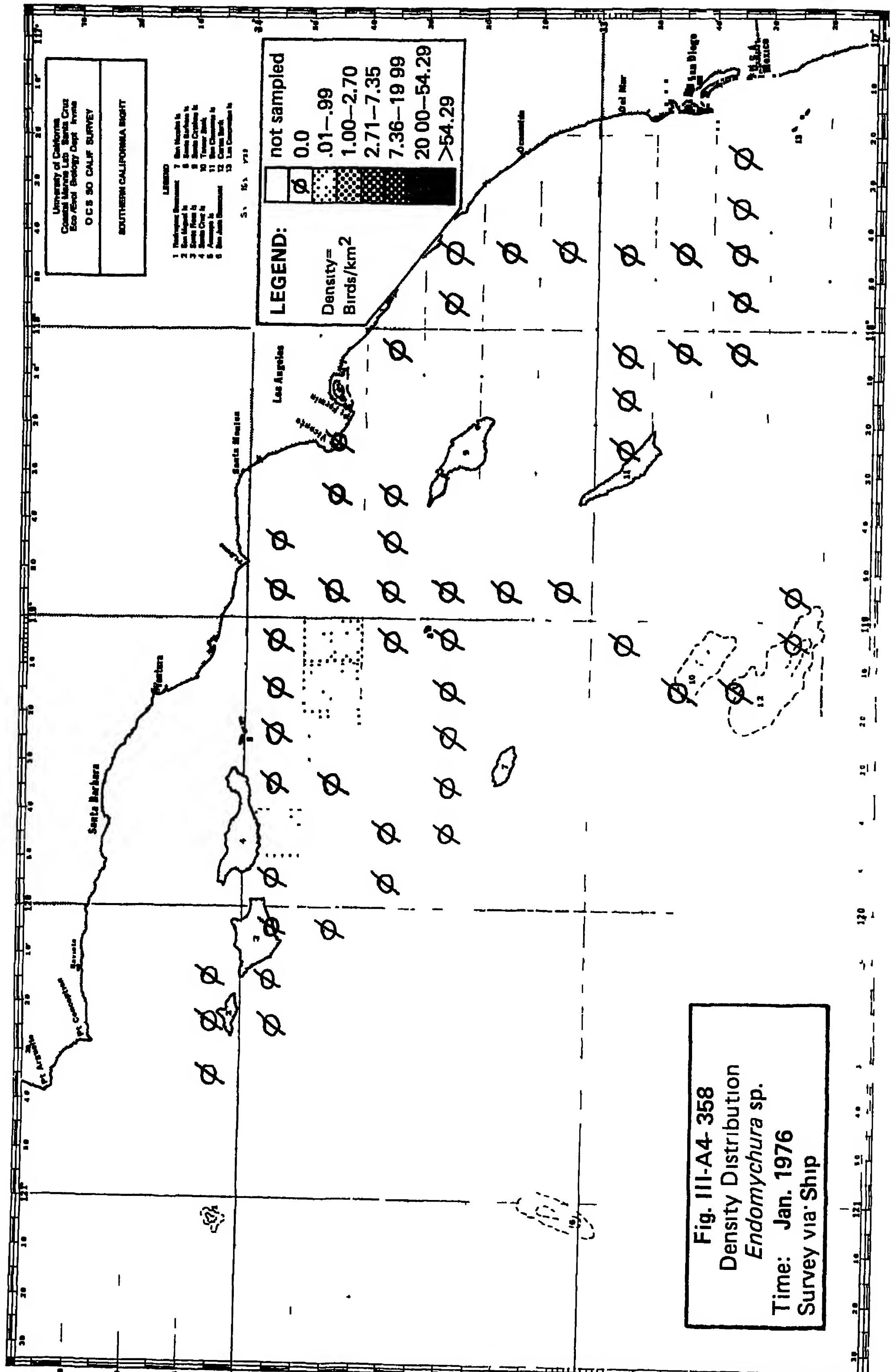


Fig. III-A4-358
Density Distribution
Endomychura sp.
Time: Jan. 1976
Survey via Ship

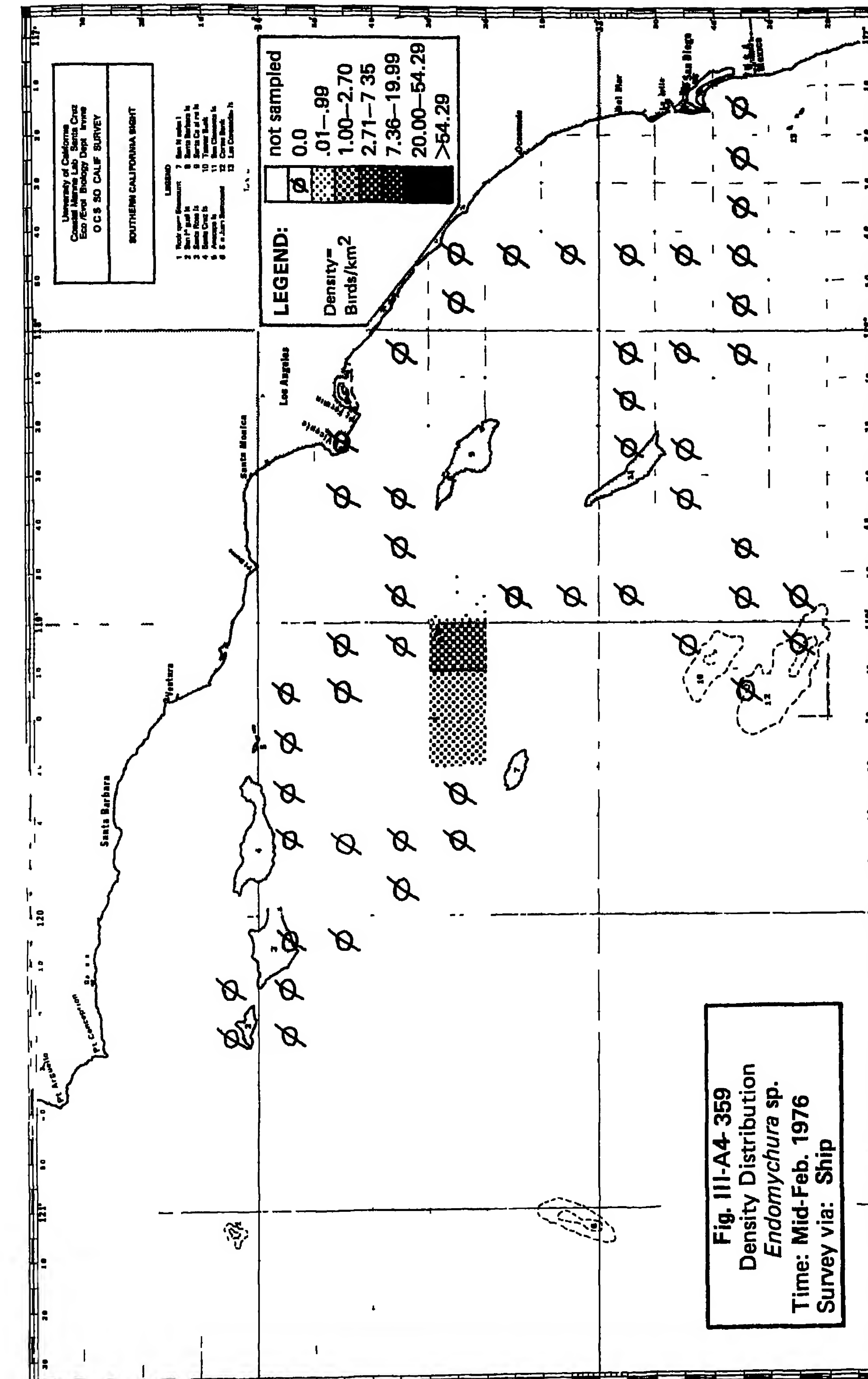


Fig. III-A4-359
Density Distribution
Endomychura sp.
Time: Mid-Feb. 1976
Survey via: Ship

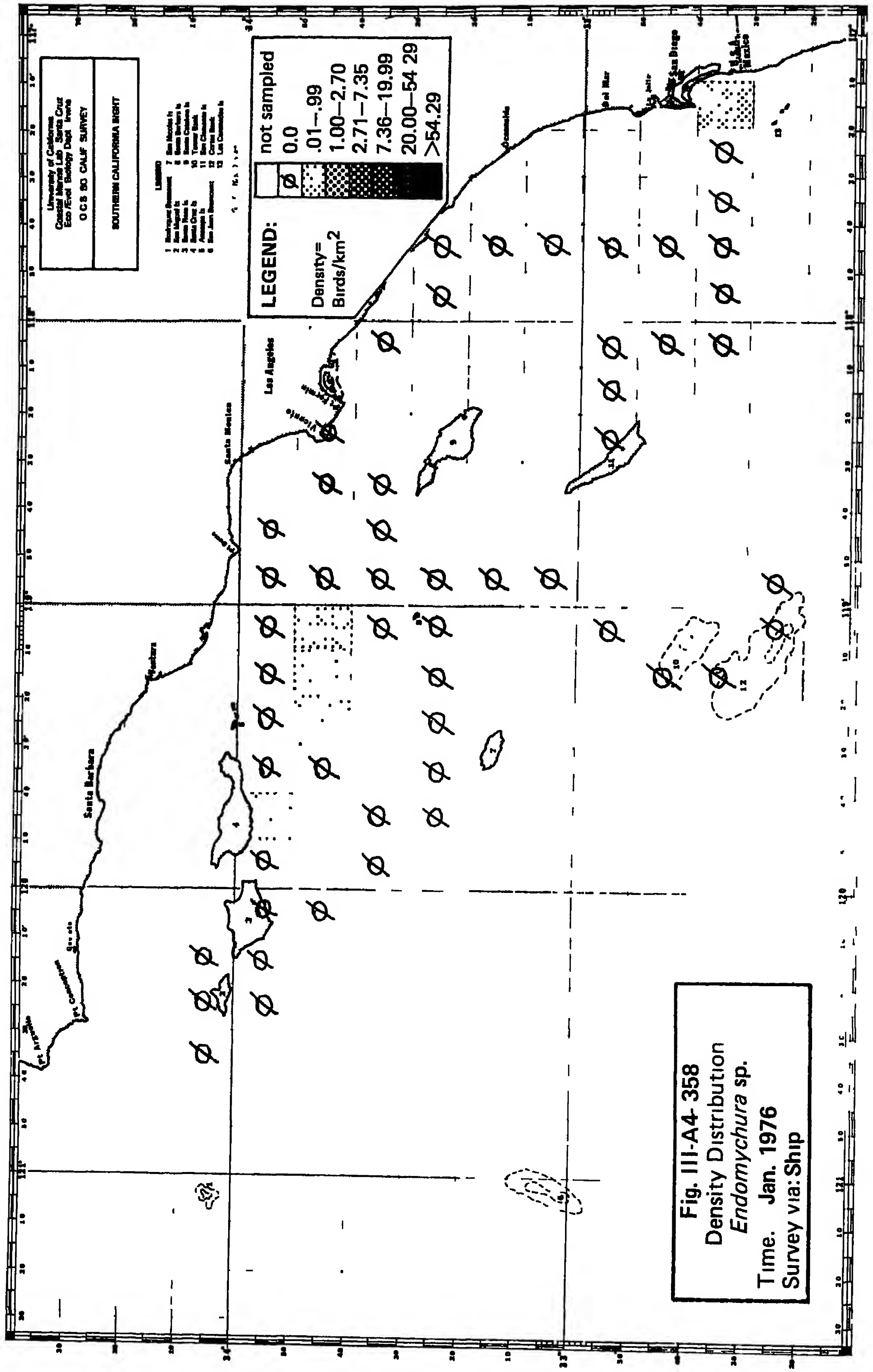


Fig. III-A4- 358
Density Distribution
Endomychura sp.
Time. Jan. 1976
Survey via:Ship

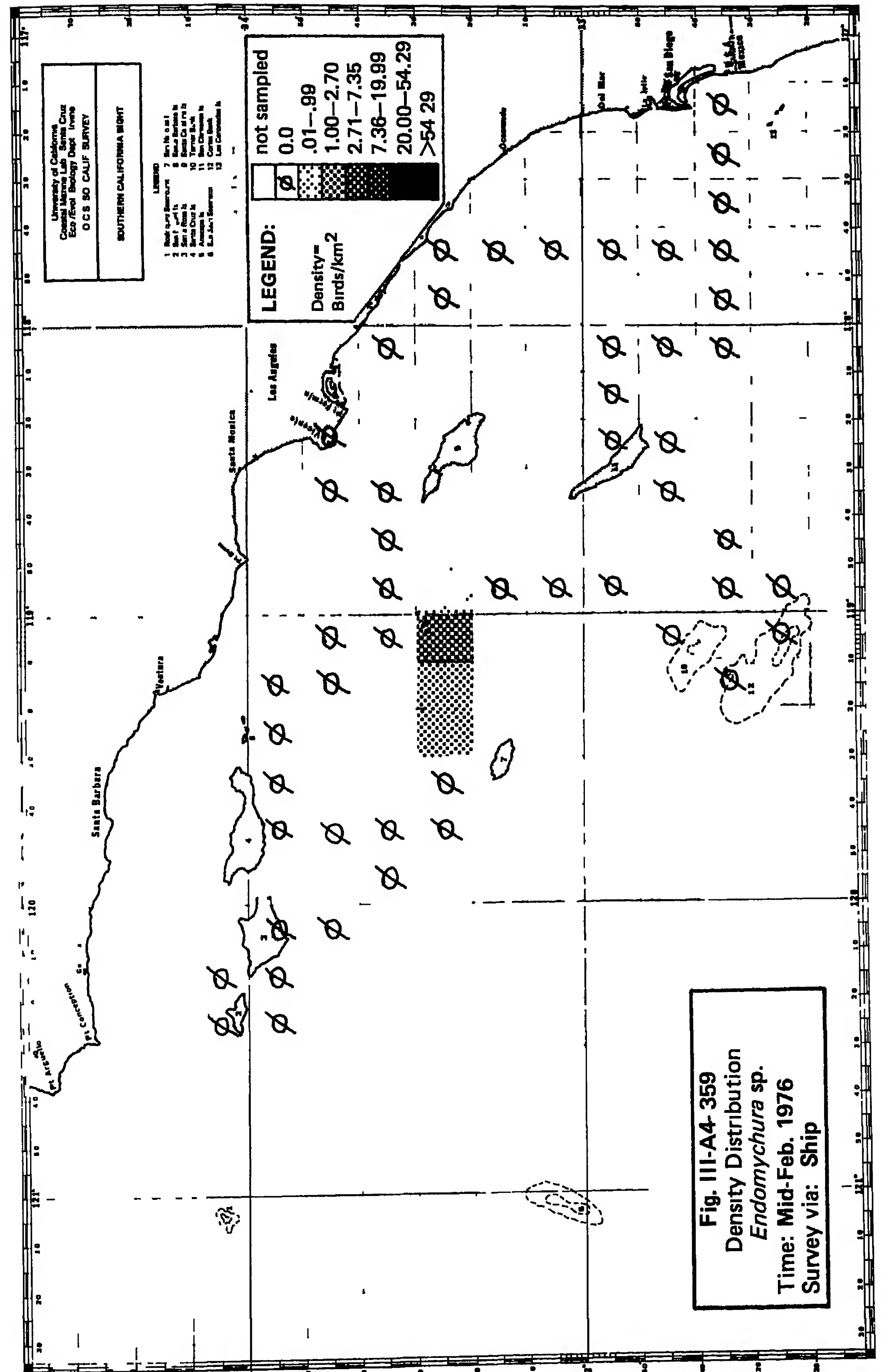


Fig. III-A4-359
Density Distribution
Endomychura sp.
Time: Mid-Feb. 1976
Survey via: Ship

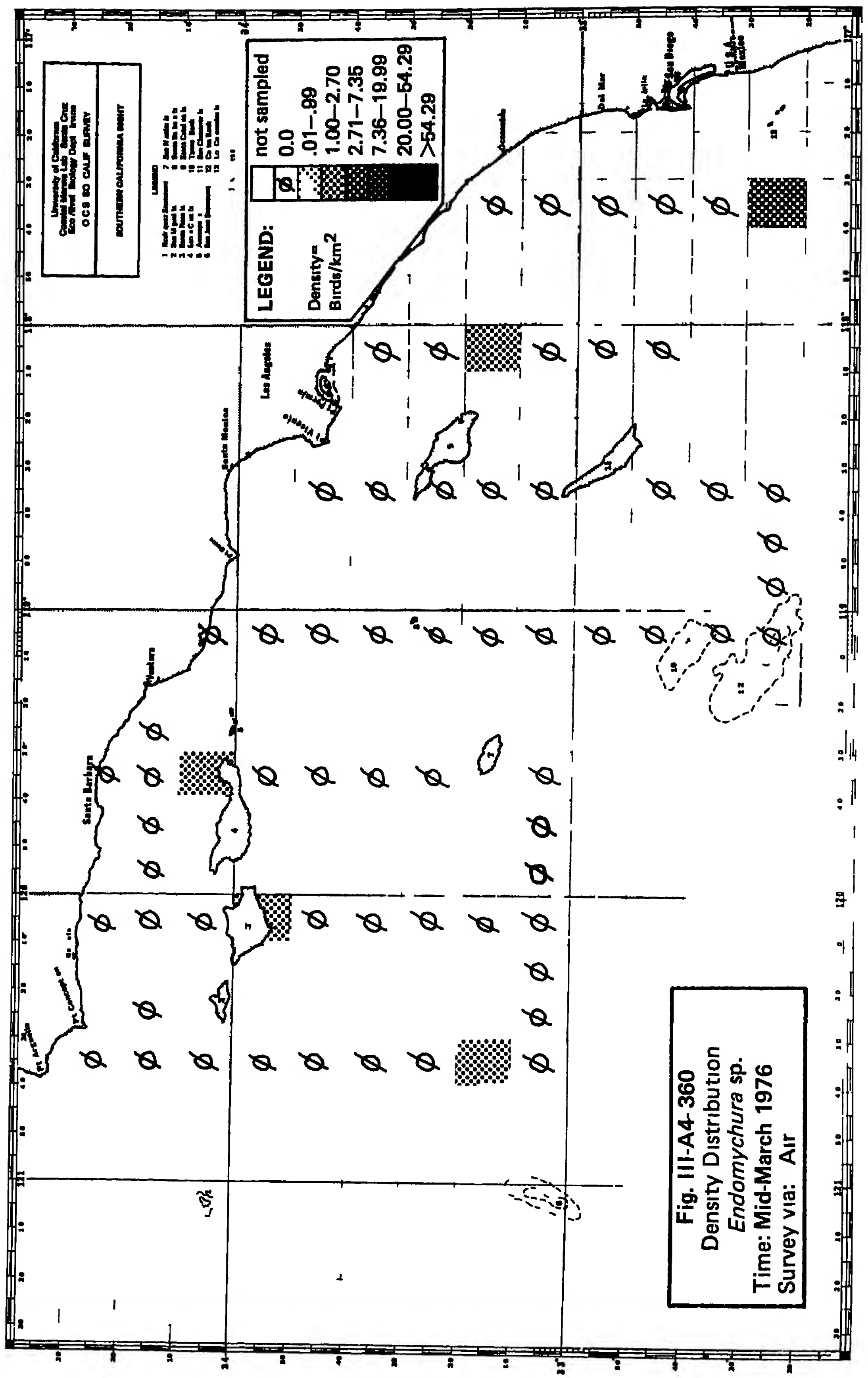


Fig. III-A4-360
Density Distribution
Endomychura sp.
Time: Mid-March 1976
Survey via: Air

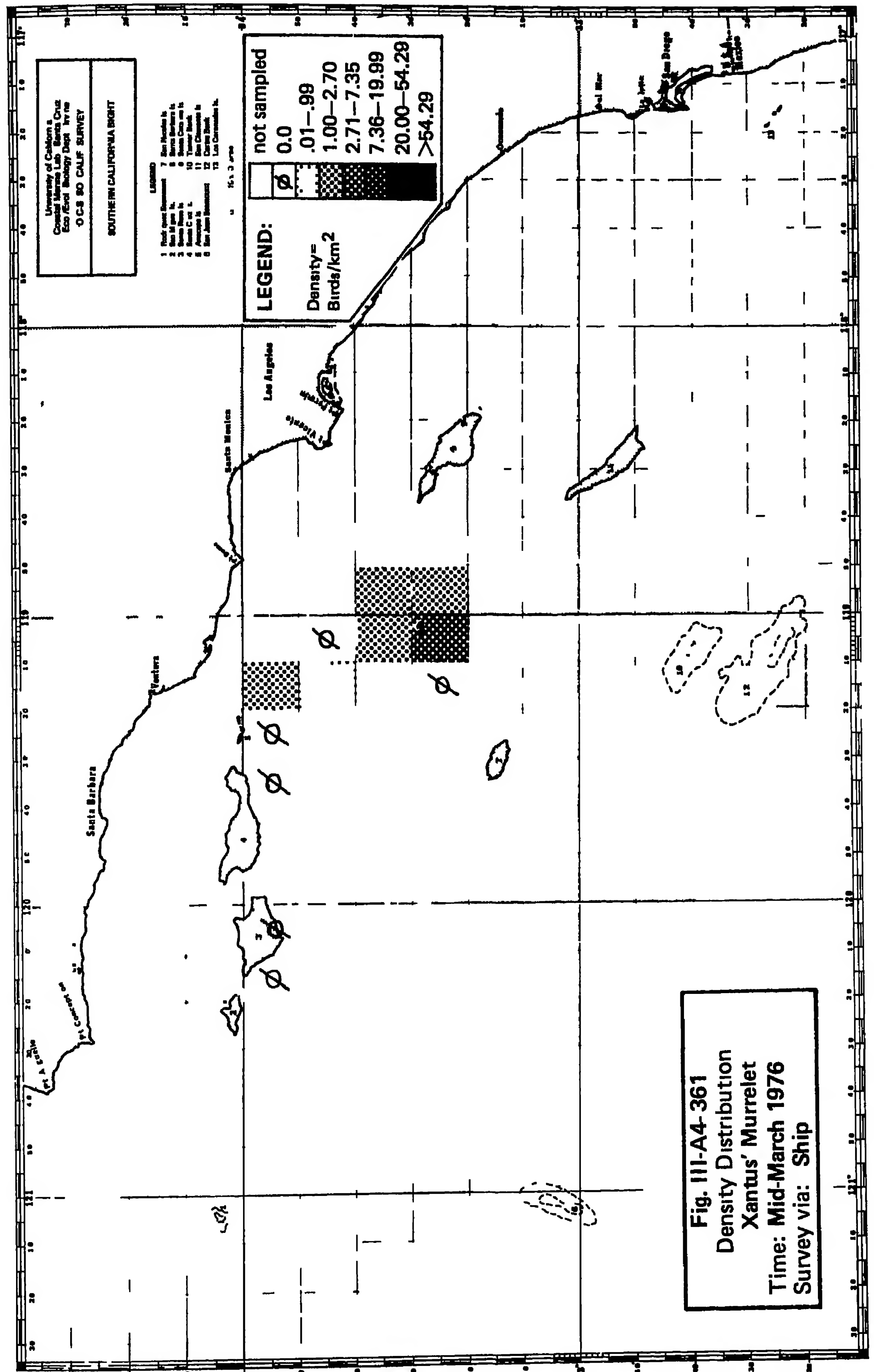


Fig. III-A4-361
Density Distribution
Xantus' Murrelet
Time: Mid-March 1976
Survey via: Ship

Ancient Murrelet (Synthliboramphus antiquus)

The Ancient Murrelet is described by modern authors (Scott 1974, Small 1975) as an uncommon winter visitor to the California coast.

Most of these cold-water birds spend their entire lives on northernmost Pacific waters. During the breeding season they are found on nearshore islands and associated sheltered deep-water bays of the Pacific coast from southeastern Alaska to Japan (Bent 1919). They nest on islands, where crevices and burrows are preferred nest sites. Conclusion of the breeding season marks the onset of a widespread movement to offshore waters, followed by a more gradual southward dispersal (Bent 1919). Early migrants may be seen off the northern California coast by October.

Most authors agree that Ancient Murrelets winter well offshore, but the boundaries of "well offshore" are poorly delimited. The winter range extends along the Pacific coast from the breeding grounds to central California. Historically, they are described as regular in southern California in winter (Howell 1917, Willet 1933, Grinnell and Miller 1944), but in recent years they have been quite scarce south of Pt. Conception. Grinnell and Miller (1944) note that there are many records of dead birds washed up on beaches following storms or oil spills at sea. Apparently most Ancient Murrelets have left California waters by April.

Ancient Murrelets feed primarily on small pelagic invertebrates which are taken on, or a few feet below, the surface (Bent 1919).

1975-76 Baseline Data

Two records, see Volume III, p. III-617.

Cassin's Auklet (Ptychoramphus aleuticus)

Cassin's Auklet is the most abundant of the alcids found in the Southern California Bight, where it is a permanent resident. Its breeding range, the most extensive of the alcids, extends from the Aleutian Islands, Alaska (Murie 1959), to Isla San Roque, Baja California Sur, Mexico (van Rossem 1939, Udvardy 1963). Of the two subspecies, P. a. australis breeds in the southernmost colonies, while P. a. aleuticus breeds on islands from mid-Baja California Norte northward (Udvardy 1963). However, it is doubtful that individuals captured in the Southern California Bight can be safely assigned to a particular subspecies at any season (Speich pers. comm.).

Nesting activities extend from December through July in the Southeast Farallon Is. colony (Manuwal 1974a). Nests consists of burrows or rock crevices in flat areas of accumulated soil, rock-falls, sea caves and various other suitable locations (Manuwal 1974a, Speich pers. comm.). Cassin's Auklets are found on the surface of the colony only at night, when nest relief and the feeding of young are accomplished (Speich and Manuwal 1974). They feed diurnally near their breeding colonies on micronekton (Payne 1965, Thoreson 1964, Manuwal 1974a), which they carry to their young in a sublingual gular pouch (Speich and Manuwal 1974). The food brought to young birds on the Farallon Islands consists mainly of euphausiids (Thysanoessa spinifera), amphipods (Phromema), and immature squid (unidentified), all of which are apparently captured beneath the surface (Manuwal 1974a).

The largest colony in California is found on Southeast Farallon Is. where an estimated 105,000-120,000 birds nested in 1971-72 (Speich

and Manuwal 1974). The winter dispersal of nesting birds is supposed to be near the breeding colony (Howell 1917, Gabrielson and Lincoln 1959, Manuwal 1974). Although birds are found at all seasons in the Southern California Bight, there is an influx of birds into the area each fall and winter, the exact origin of which is unknown (Speich pers. comm.). P.O.B.S.P. surveys of the Eastern Grid found them present in all seasons with highest numbers recorded during winter months; the largest concentrations were located in the northeast section of the grid near Pt. Concenption (Pyle and DeLong 1968 ms).

Large numbers of Cassin's Auklets are occasionally found dead on beaches after storms (Howell 1917, Bent 1919), but in at least one instance (Bent 1919), mass mortality was attributed to an epidemic of intestinal tapeworms. Howell (1917) also reported significant depredation of auklets on their breeding grounds by Peregrine Falcons.

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding status data collected during the 1975-76 season are contained in pp. III-516-535

1975-76 Baseline Data

April 1975. One bird recorded 2 km south of Cluster Pt., Santa Rosa Is.
May 1975. Two birds were seen during aerial surveys, both 25 km east of the southeastern end of San Clemente Is. Shipboard observers found dense concentrations of auklets near the Prince Is. and Castle Rk. colonies at San Miguel Is. and moderate concentrations near Gull Is. (Fig. III-A4-362). Density immediately south of San Miguel Is. was much lower than north of the island. Other scattered sightings were made in Santa Cruz

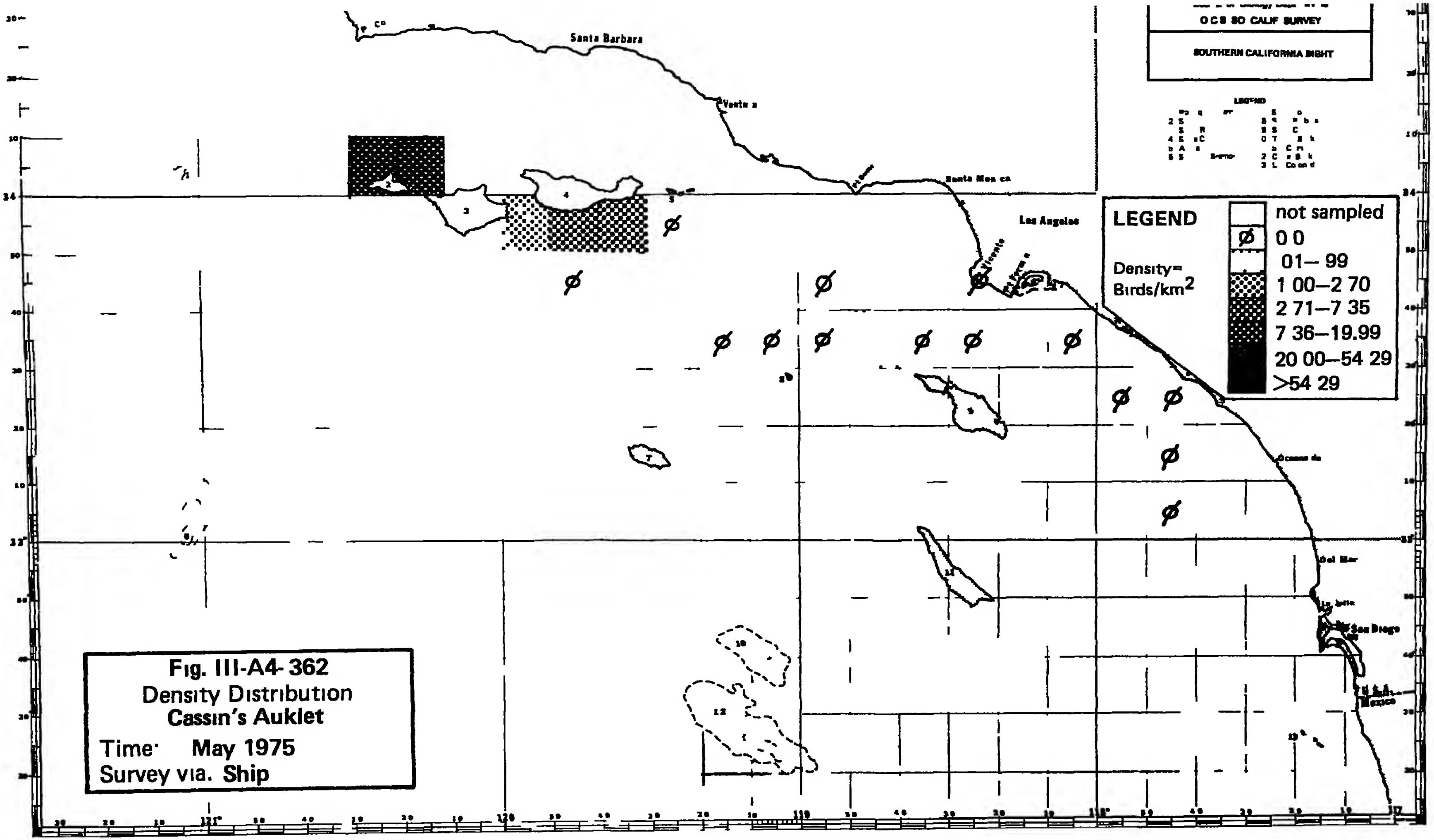


Fig. III-A4-362
Density Distribution
Cassin's Auklet
Time: May 1975
Survey via. Ship

Cassin's Auklet (continued)

Basin, near the west end of Santa Catalina Is. and in the Fortymile Bank area.

June 1975. Only three Cassin's Auklets were recorded this month: two birds were seen off Richardson Rk., San Miguel Is.; another bird was seen 1 km off Fraser Pt., Santa Cruz Is.

July 1975. Intense concentrations of auklets were located immediately north of San Miguel Is. (Fig. III-A4-363). Moderate numbers were recorded in San Miguel Passage, south of Gull Is., and between San Nicolas and Santa Barbara Islands. Cassin's Auklets were also recorded near Santa Catalina and Santa Barbara Islands and near Palos Verdes Peninsula.

August 1975. Two sightings totalling four birds: three birds were observed near Pt. Conception, and one bird was seen at the north end of Anacapa Passage.

September 1975. Three sightings totalling seven birds: five birds off South Pt., Santa Rosa Is.; one bird 22 km west of San Nicolas Is.; one bird halfway between Santa Rosa Is. and San Nicolas Is.

October 1975. None recorded.

November 1975. Three birds (two sightings) were observed halfway between Santa Rosa and San Nicolas Islands along the Santa Rosa-Cortés Ridge.

December 1975. Ship surveys in mid-month revealed Cassin's Auklets in moderate numbers along the Santa Rosa-Cortés Ridge south of Santa Barbara Is. and near Tanner-Cortés Banks (Fig. III-A4-364). Scattered birds were also sighted at Anacapa Passage, Santa Barbara Is., and between San Clemente Is. and San Diego. Aerial surveys found these birds near Richardson Ri., San Miguel Is.; south of Santa Barbara Is.; 46 km west of San

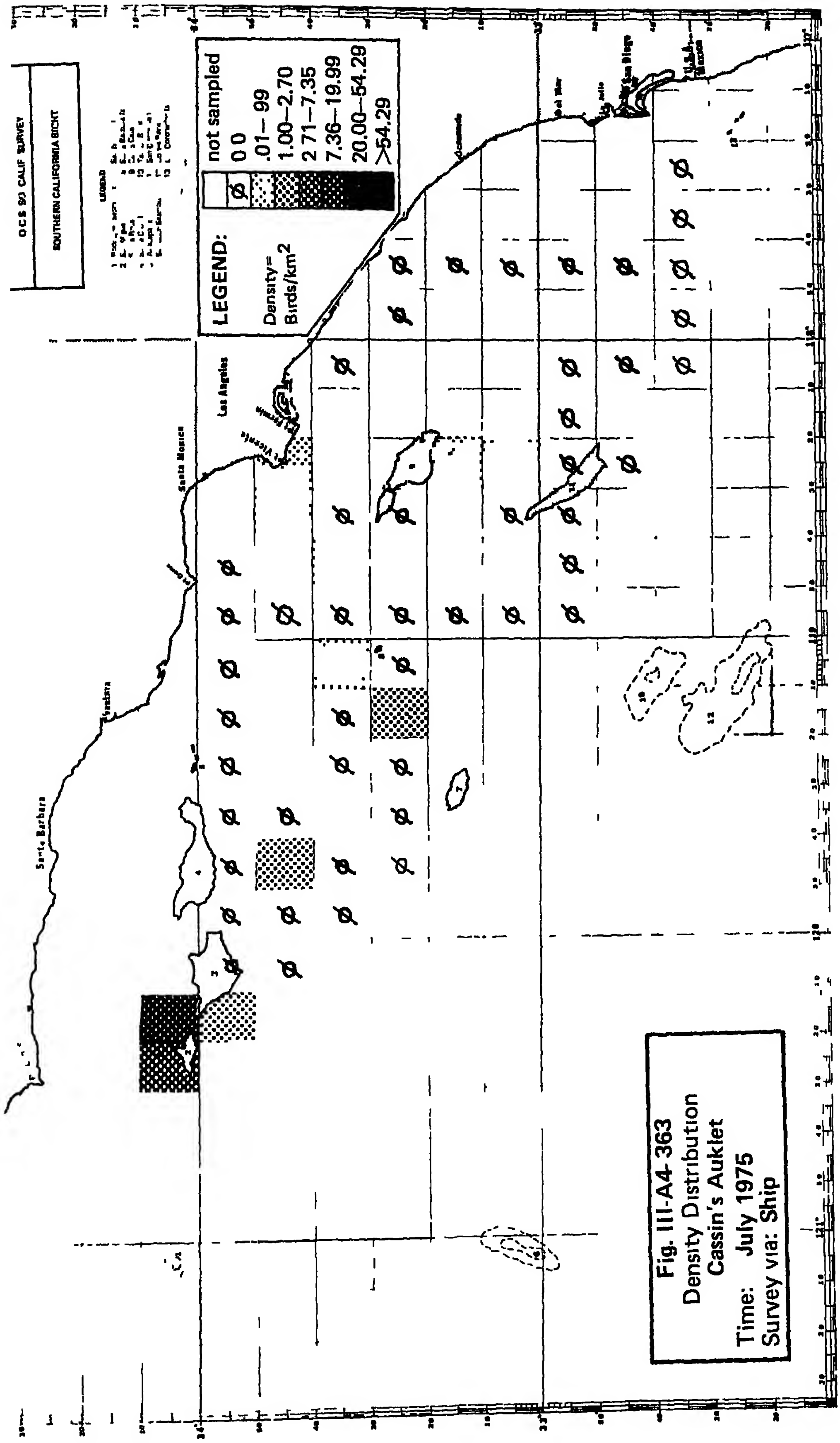


Fig. III-A4-363
Density Distribution
Cassin's Auklet
Time: July 1975
Survey via: Ship

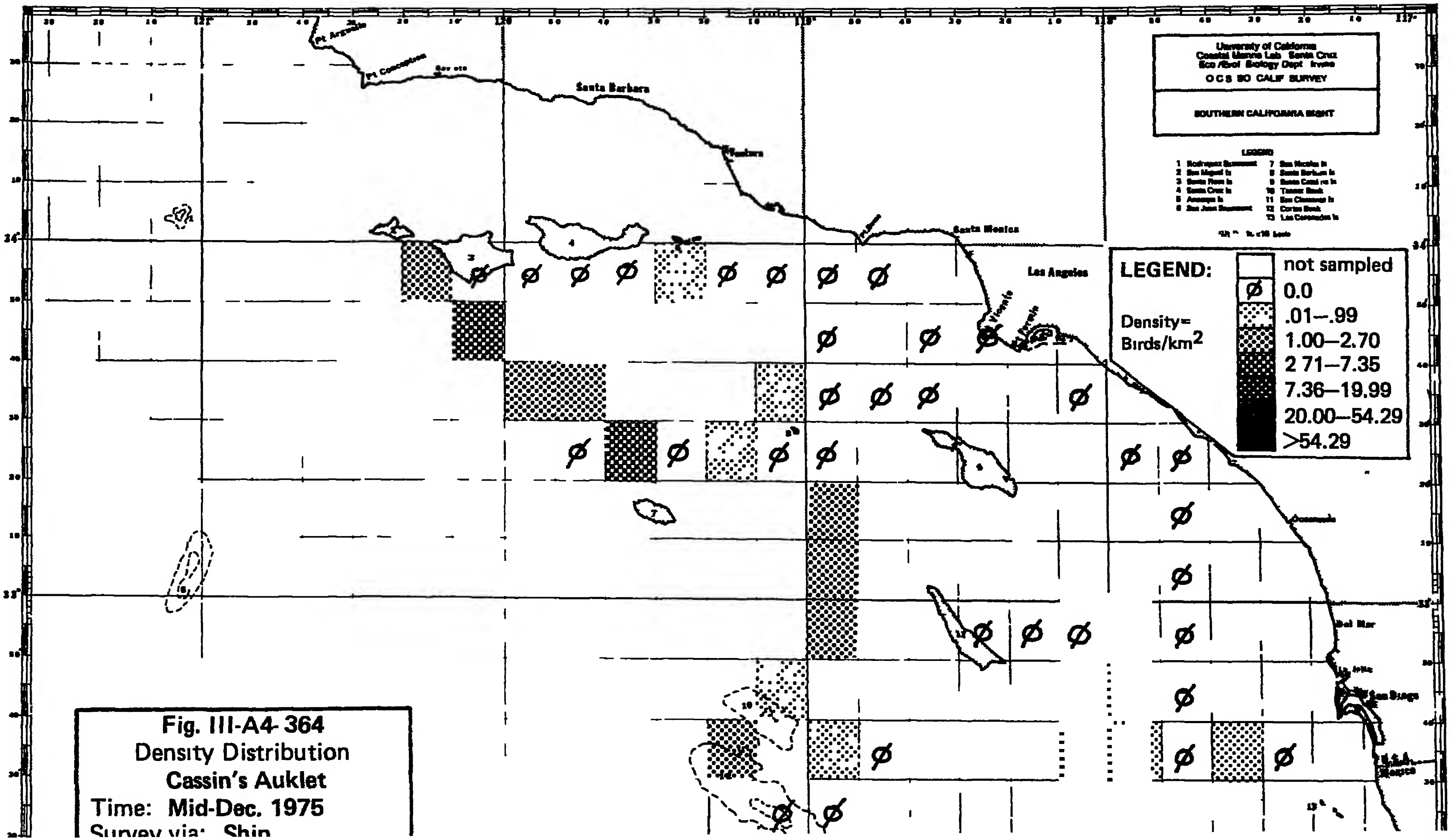


Fig. III-A4-364
Density Distribution
Cassin's Auklet
Time: Mid-Dec. 1975
Survey via: Ship

Cassin's Auklet (continued)

Clemente Is., and 77.7 km east of Cortés Bank.

<u>January 1976</u>. (Figs. III-A4-365, 366). Ship and aerial surveys found Cassin's Auklet to be common to abundant in the Southern California Bight. Highest concentrations were located to the north and west of San Miguel Is. Somewhat lower numbers were recorded immediately south and west of the island. These auklets were also abundant just southwest of Anacapa Is. and north of San Nicolas Is. Moderate concentrations appeared near San Juan Seamount, along the Santa Rosa-Cortés Ridge, on the south sides of the northern Channel Islands, near Santa Barbara Is., in Santa Barbara Channel, and near San Diego. Scattered sightings were made throughout the rest of the Bight except in San Pedro Channel and the northern part of the Gulf of Santa Catalina, and seaward of the Patton Escarpment.

<u>February 1976</u>. By February, the distribution of Cassin's Auklets had apparently shifted, leaving very few birds in the southeast portion of the study area (Fig. III-A4-367). High concentrations were still found immediately north of San Miguel Is.; scattered birds were observed along the south sides of the northern Channel Islands, except at Anacapa Passage where exceptional numbers were seen. Scattered sightings were also made between San Nicolas and Santa Barbara Islands.

<u>March 1976</u>. Limited ship surveys indicated that Cassin's Auklets were concentrated near the San Miguel Is. colonies and at Anacapa Passage (Fig. III-A4-368). Scattered sightings were made along the south sides of the northern Channel Islands, near Santa Barbara Is. and 42 km west of San Clemente Is.

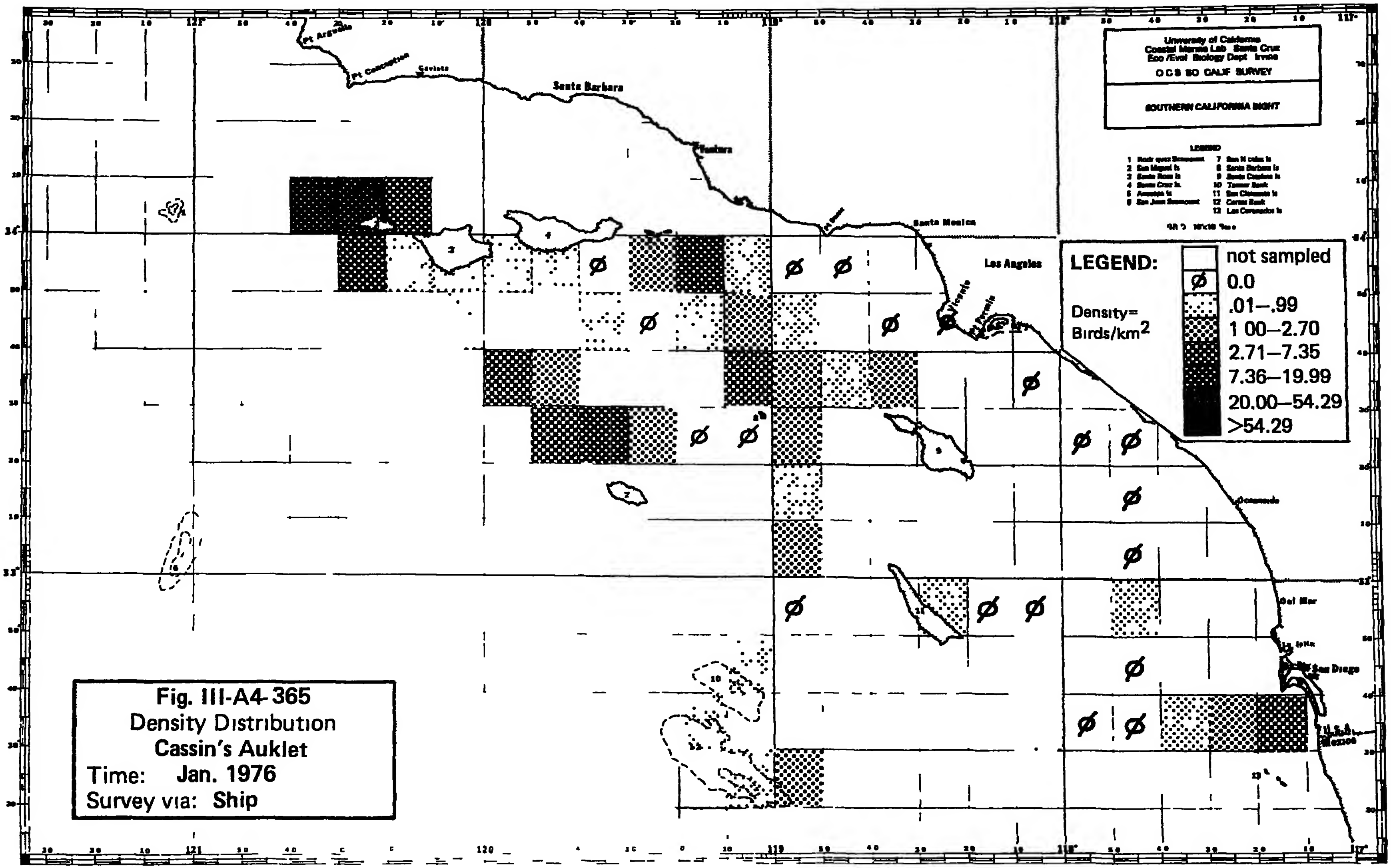
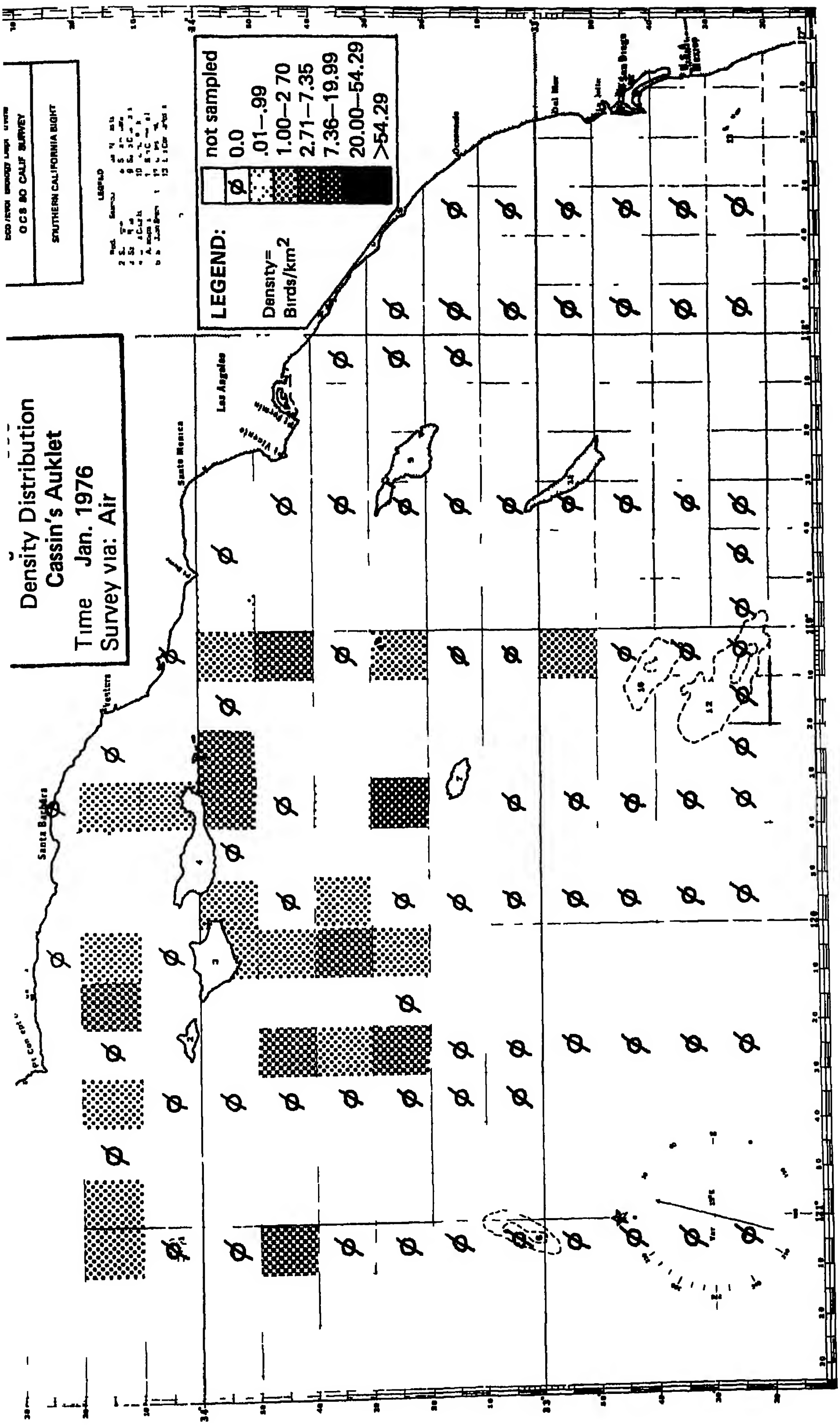


Fig. III-A4-365
Density Distribution
Cassin's Auklet
Time: Jan. 1976
Survey via: Ship



Density Distribution
Cassin's Auklet
Time Jan. 1976
Survey via: Air
LEGEND:
Density=
Birds/km2
not sampled
0.0
.01—.99
1.00—2.70
2.71—7.35
7.36—19.99
20.00—54.29
>54.29
OCS SO CALIF SURVEY
SOUTHERN CALIFORNIA BIGHT
Santa Barbara
Ventura
Santa Monica
Los Angeles
Oceanside
Del Mar
San Diego

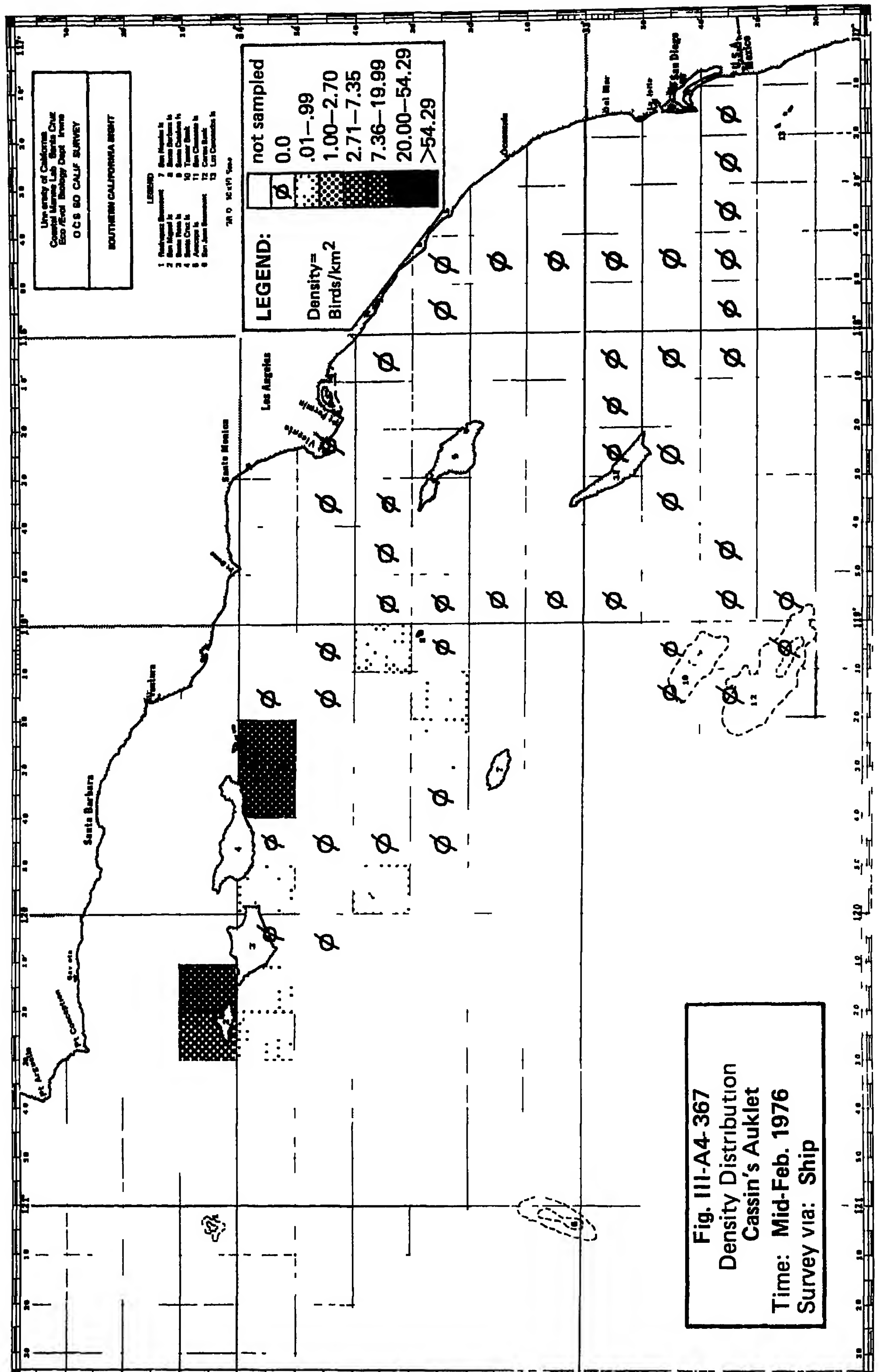


Fig. III-A4-367
Density Distribution
Cassin's Auklet
Time: Mid-Feb. 1976
Survey via: Ship

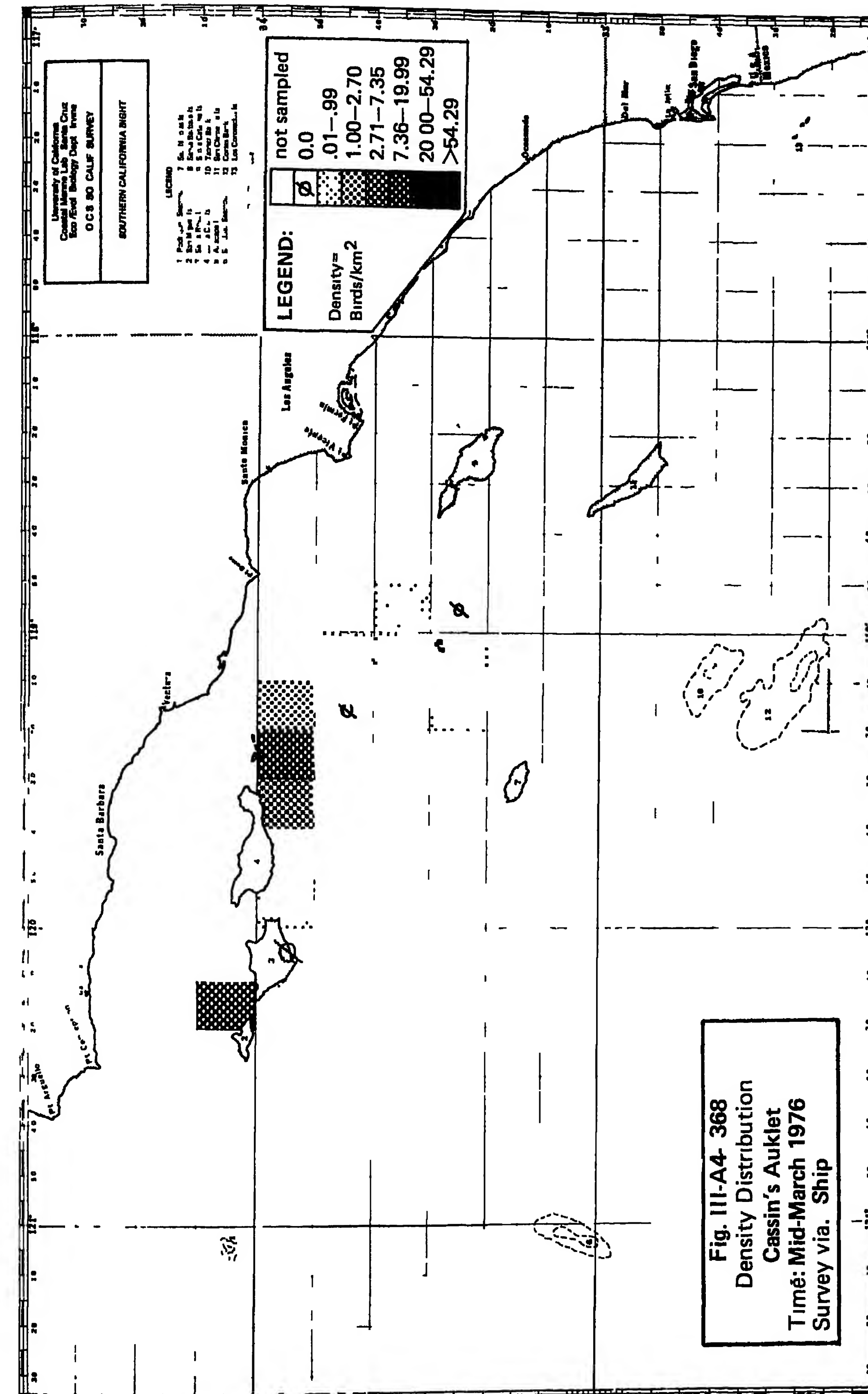


Fig. III-A4- 368
Density Distribution
Cassin's Auklet
Time: Mid-March 1976
Survey via: Ship

Rhinoceros Auklet (Cerorhinca monocerata)

This species breeds on widely scattered islands along both shores of the North Pacific (Udvardy 1963). Breeding sites in North America extend from southeastern Alaska to the Farallon Islands off San Francisco (Gabrielson and Lincoln 1959, Richardson 1961, Ainley and Lewis 1974). Apparently, southward expansion of the breeding range has recently occurred (Ainley and Lewis 1974, Scott et al. 1974). The species was formerly considered strictly nocturnal on the breeding grounds (Dawson and Bowles 1909, Heath 1915, Bent 1919, Gabrielson and Lincoln 1959, Richardson 1961), but recent observations in Oregon and California (Scott et al. 1974) have provided interesting exceptions. The birds nest in deep burrows, usually 1.5-2.5 m in length, though burrows over 6.1 m have been reported (Dawson and Bowles 1909, Heath 1915, Richardson 1961). Richardson (1961) found that preferred burrow sites on Protection Is., Washington, were located on steep (37°-45°) slopes of firm, sandy soil, usually 9+ m above adjacent beaches; he found densities of about one nest per 100 square feet. Heath (1915) found 400 burrows within 600 square feet in dense spruce forest with little undergrowth on Forrester Is., Alaska. Breeding activities begin with burrow excavation in early March on Protection Is. Both parents probably participate in the incubation of the single egg (Heath 1915, Richardson 1961). All of most of the young are fledged by early August (Richardson 1961).

The birds winter at sea from Washington south to San Geronimo and Cedros Islands off Baja California (Bent 1919). In southern California, the Rhinoceros Auklet is a common winter resident, arriving in September and October and departing by early May (Howell 1917, Willet 1933, Grinnell and Miller 1944). A few individuals may be found

all year, but greatest numbers are seen from January to March (Scott 1974). Howell (1917) describes them as "deep-water fishermen... to be found near islands only where the ocean bottom drops abruptly". Pyle and DeLong (1968 ms) found them mostly inshore during winter surveys of the P.O.B.S.P. Eastern Grid. Scott (1974) describes their habitat in southern California as open ocean from 0-40 km offshore; they occur in Santa Barbara and San Pedro Channels but with numbers increasing towards the outer islands. Moderate numbers are regularly seen during winter pelagic trips from most southern California ports (McCaskie 1965-1975).

Rhinoceros Auklets eat small schooling fish and crustaceans. Heath (1915) found them feeding exclusively upon sand lance (Ammodytes tobianus) at Forrester Is., and Richardson (1961) obtained similar results except for a single specimen of a smelt (Hypomesus pretiosus?) at the Protection Is. colony. Koslova (in Richardson 1961) found northwestern Pacific birds eating mostly marine invertebrates, with the young being fed two kinds of smelt, young salmon and other fish. Grinnell (1899) found only small, yellow, midwater crustaceans (Euphausiidae?) in the gullets of ten specimens taken in November and December in southern California waters. Linton (1908) found small sardines (3-4 inches) in the "craws" of several California specimens whose stomachs contained the meat and bones of small fish.

Little is known of mortality in Rhinoceros Auklets. Richardson (1961) reviewed colony-associated instances, citing burrow cave-ins by humans or sheep as the most serious mortality factor. Other dangers included flying into obstructions near the colony and possible predation by a Great Horned Owl (Bubo virginianus). Historically, they were

Rhinoceros Auklet (continued)

taken by natives on Destruction Is. (Bent 1919).

1975-76 Baseline Data

April 1975. Six birds were observed: three near Cluster Pt., Santa Rosa Is.; two 22 km south of Gull Is.; and one 9 km northwest of Santa Barbara Is.

May 1975. Three birds were sighted: one in Anacapa Passage; one 26 km west of Dana Pt.; and one 3.5 km north of Prince Is.

June - November 1975. None recorded.

December 1975. Rhinoceros Auklets reappeared in large numbers in the Southern California Bight (Fig. III-A4-369). Ship surveys found them concentrated along the Santa Rosa-Cortés Ridge between San Miguel and San Nicolas Islands, south of Santa Barbara Is. to Tanner and Cortés Banks, and between San Clemente Is. and San Diego. The birds were uncommon or absent along the south sides of the northern Channel Islands, in San Pedro Channel and in the Gulf of Catalina. Limited aerial surveys encountered them only from 18 to 35 km east of Cortés Bank where concentrations reached 10.75 birds per km^2.

January 1976. Rhinoceros Auklets continued to abound throughout most of the Bight inshore of the Patton Escarpment (Figs. III-A4-370, 371). Aerial surveys disclosed particularly heavy concentrations (up to 74 birds/km^2) near Tanner and Cortés Banks. Lower concentrations were again observed in the Gulf of Catalina and immediately south of the northern Channel Islands except near Anacapa Is.

February 1976. Increased densities of Rhinoceros Auklets were seen with a distribution pattern similar to that in January. Notable concentrations

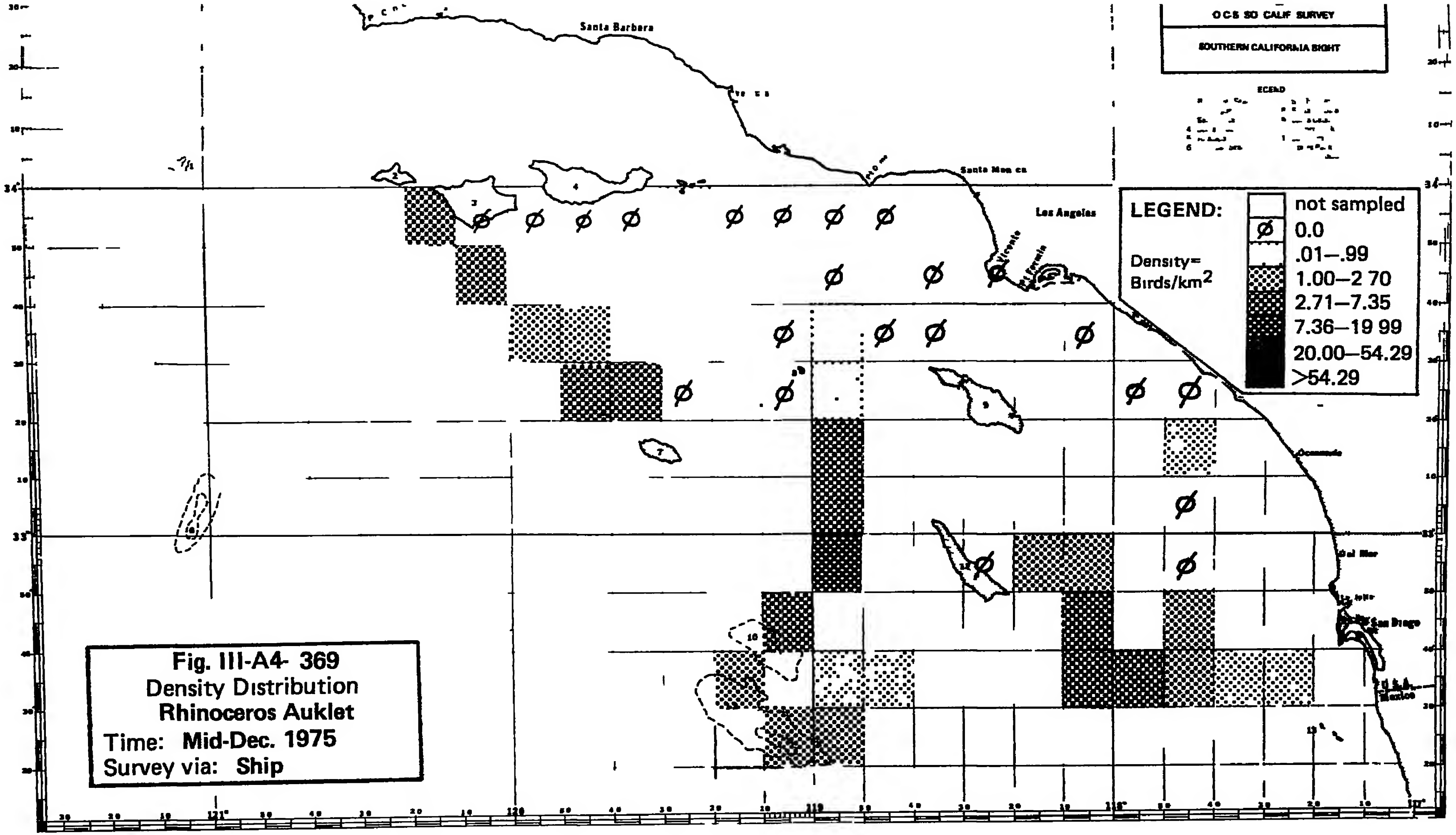


Fig. III-A4- 369
Density Distribution
Rhinoceros Auklet
Time: Mid-Dec. 1975
Survey via: Ship

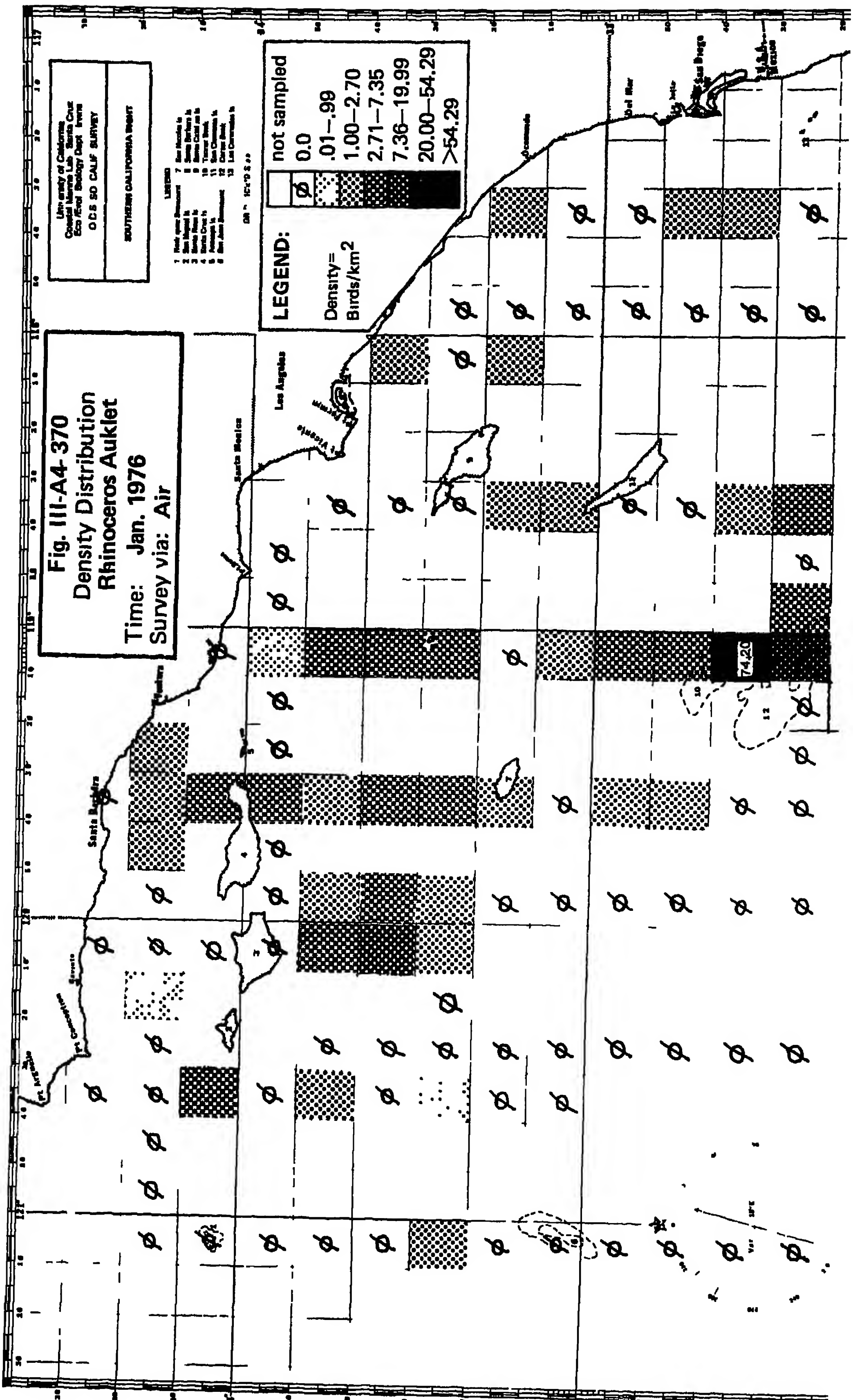


Fig. III-A4-370
Density Distribution
Rhinoceros Auklet
Time: Jan. 1976
Survey via: Air

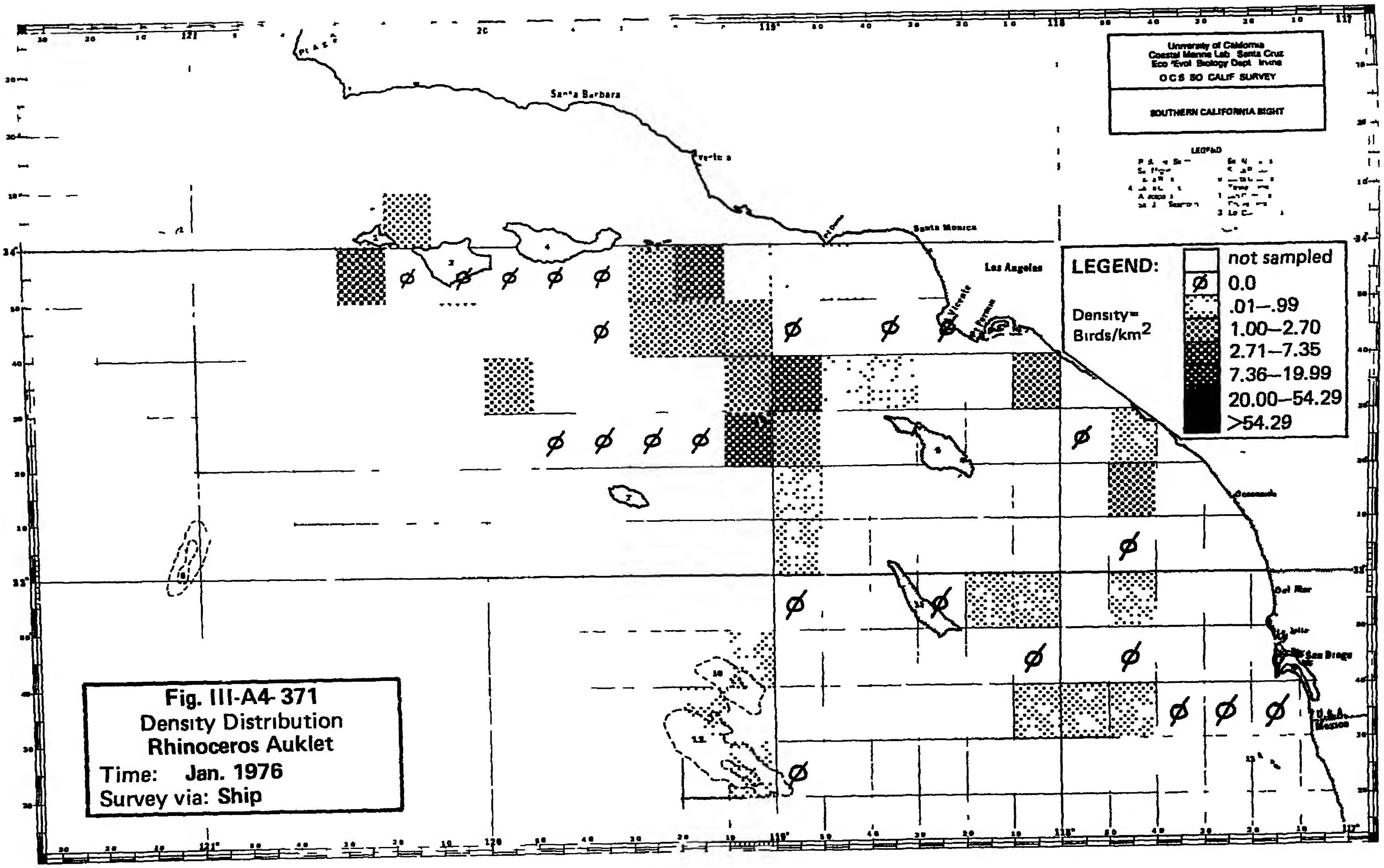


Fig. III-A4-371
Density Distribution
Rhinoceros Auklet
Time: Jan. 1976
Survey via: Ship

occurred 18-20 km south of Santa Rosa Is., immediately north of Santa Barbara Is., at Tanner and Cortés Banks, immediately east of San Clemente Is., and between San Clemente Is. and San Diego. Lowest densities were again found immediately south of the northern island chain, in San Pedro Channel and in the Gulf of Santa Catalina (Fig. III-A4-372).

March 1976. Rhinoceros Auklet densities dropped considerably during the March surveys, though pockets of high density remained (Figs. III-A4-373 and 374). Distribution was considerably more patchy than in February. Large concentrations were observed in the Santa Cruz Channel, in Anacapa Passage, and 18-35 km south of Santa Barbara Is. Lesser numbers were sighted 18-20 km south of Santa Rosa Is., in San Miguel Passage, in the waters immediately surrounding Santa Barbara Is., 18 km southwest of San Clemente Is. and 15-25 km east of Cortés Bank. The species was virtually absent from all other surveyed areas of the Bight. The concentrations observed in the passages of the northern island chain may be indicative of the spring migration to northern breeding colonies.

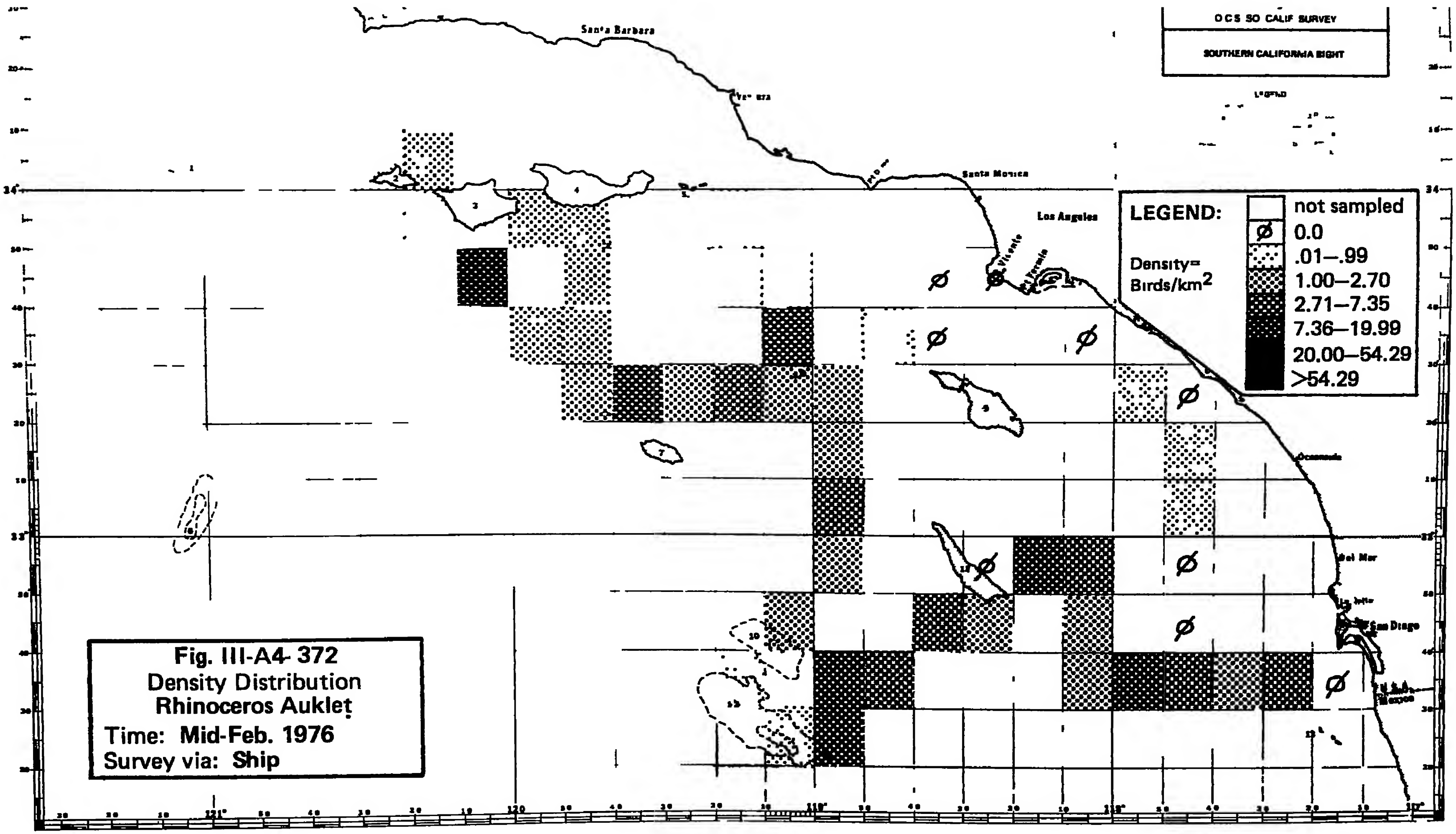


Fig. III-A4-372
Density Distribution
Rhinoceros Auklet
Time: Mid-Feb. 1976
Survey via: Ship

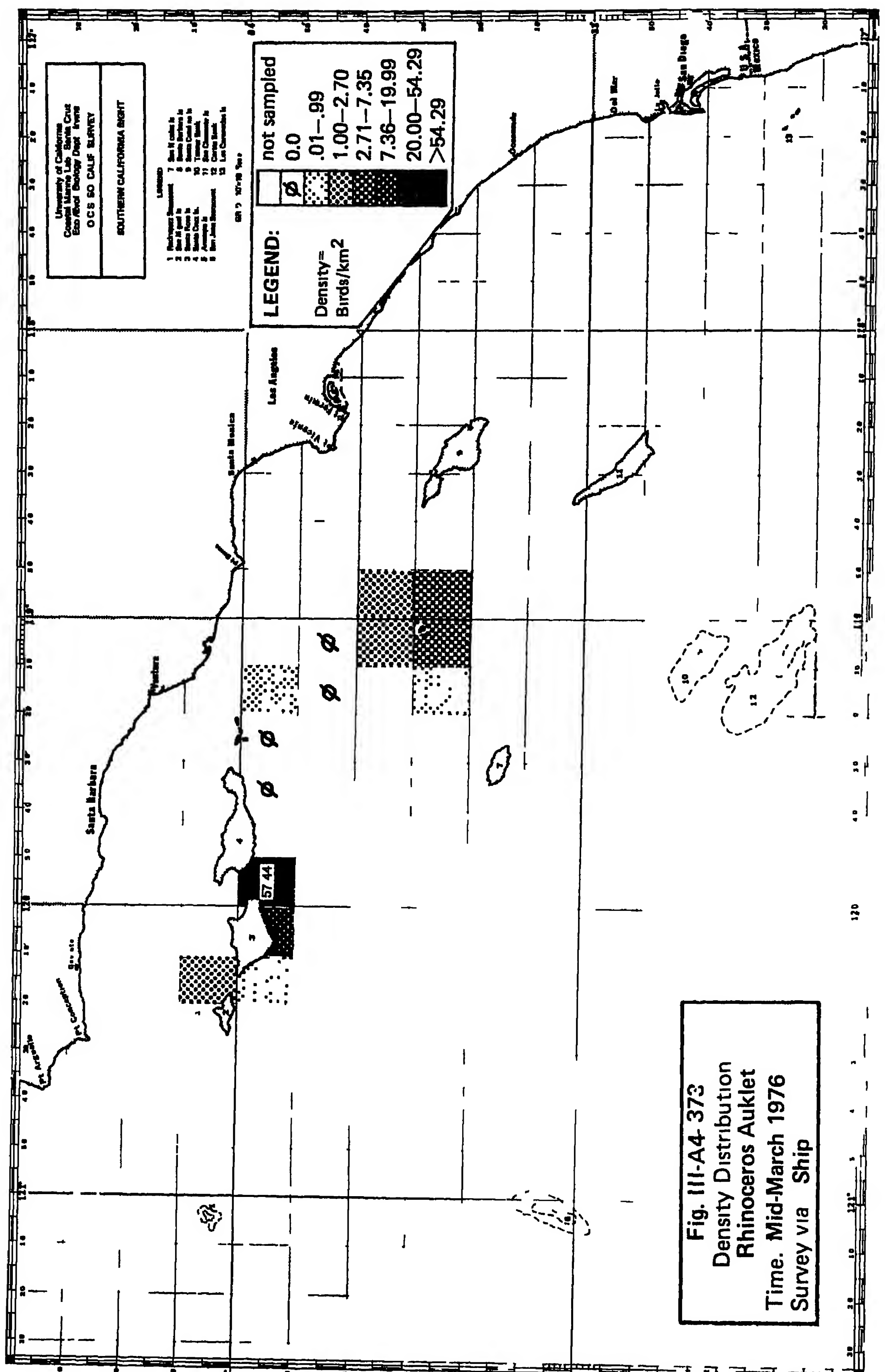


Fig. III-A4-373
Density Distribution
Rhinoceros Auklet
Time. Mid-March 1976
Survey via Ship

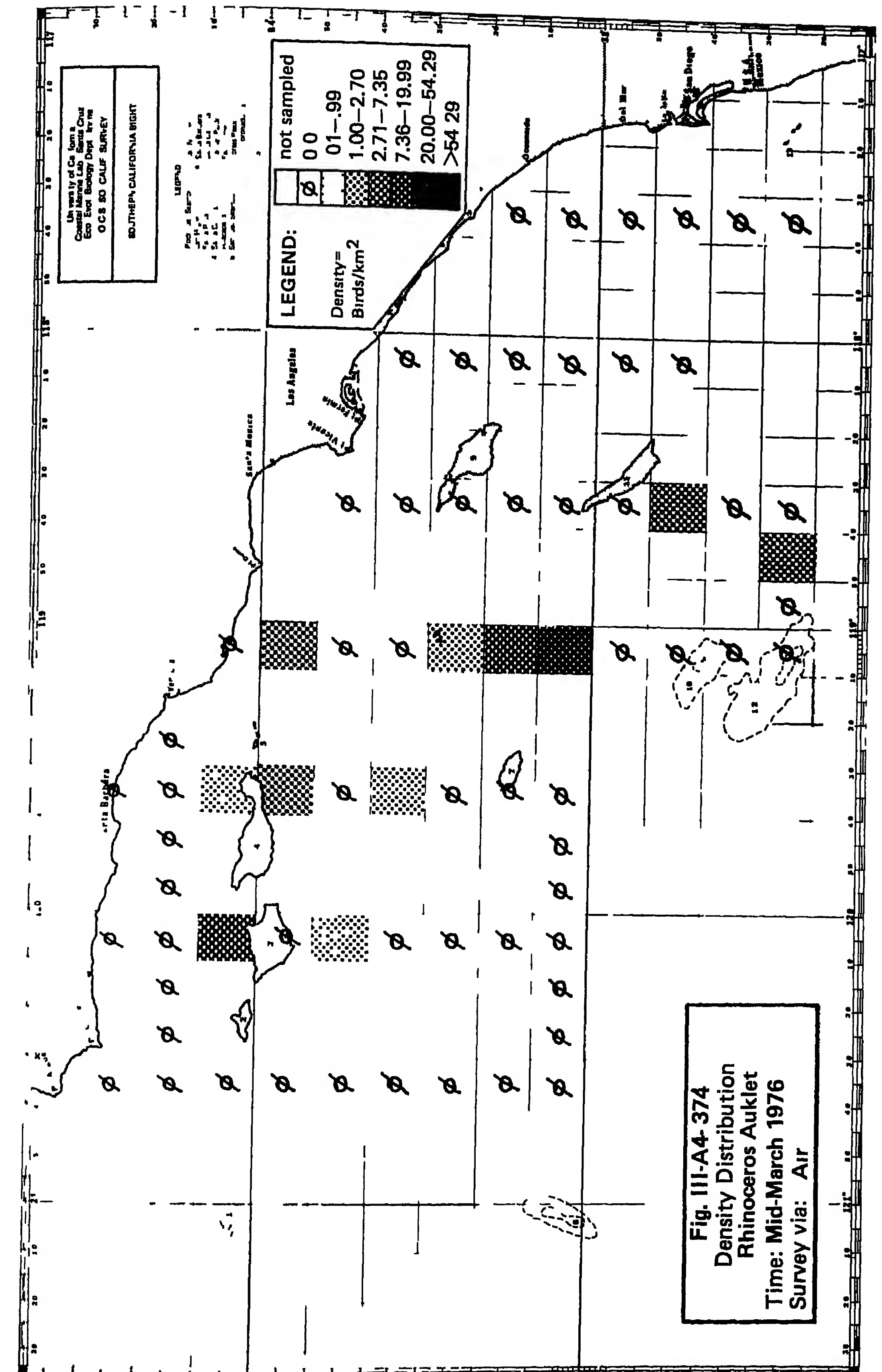


Fig. III-A4-374
Density Distribution
Rhinoceros Auklet
Time: Mid-March 1976
Survey via: Air

Tufted Puffin (Lunda cirrhata)

The Tufted Puffin is desribed as an uncommon resident along the coast of California; most birds move well offshore in non-breeding seasons.

These puffins are primarily residents of far northern Pacific waters. They breed on rocky coasts and islands of the North Pacific from Japan to California, the Bering Sea and parts of the Arctic Ocean (Udvardy 1963). Nests are built in shallow burrows or crevices. Except for the northernmost dwellers which move south, most puffins winter in the area offshore of their breeding grounds (Bent 1919, Gabrielson and Lincoln 1959).

The Tufted Puffin was formerly a common resident in the northern part of the Southern California Bight; breeding records exist for most of the Channel Islands. Historically, the birds were common in summer in the waters adjacent to breeding colonies, but rare in these waters in other seasons as the bulk of the population moved offshore (Howell 1915, Willet 1933, Grinnell and Miller 1944). At present, Tufted Puffins are rare to uncommon in the Bight with the largest number of records for late spring-early summer, and the fewest for winter (McCaskie 1965-1975). Offshore, Pyle and DeLong (1968 ms) noted they were uncommon in the P.O.B.S.P. Eastern Grid in winter.

Fish such as smelt, sardine, and herring make up the bulk of the puffin's diet, but molluscs, sea urchins, and algae may also be used (Bent 1919).

Information concerning the historical breeding status of this species is included in Appendix III-A3. Breeding colony data are summarized on pp. III-535 and III-629-632.

1975-76 Baseline Data

April 1975. None recorded.

May 1975. Three Tufted Puffins were observed this month during shipboard surveys: a single bird was sighted 4.5 km south of Crook Pt., San Miguel Is. on 13 May; two sightings of single birds were made between 15 and 25 km northwest of Santa Barbara Is. on 27 May.

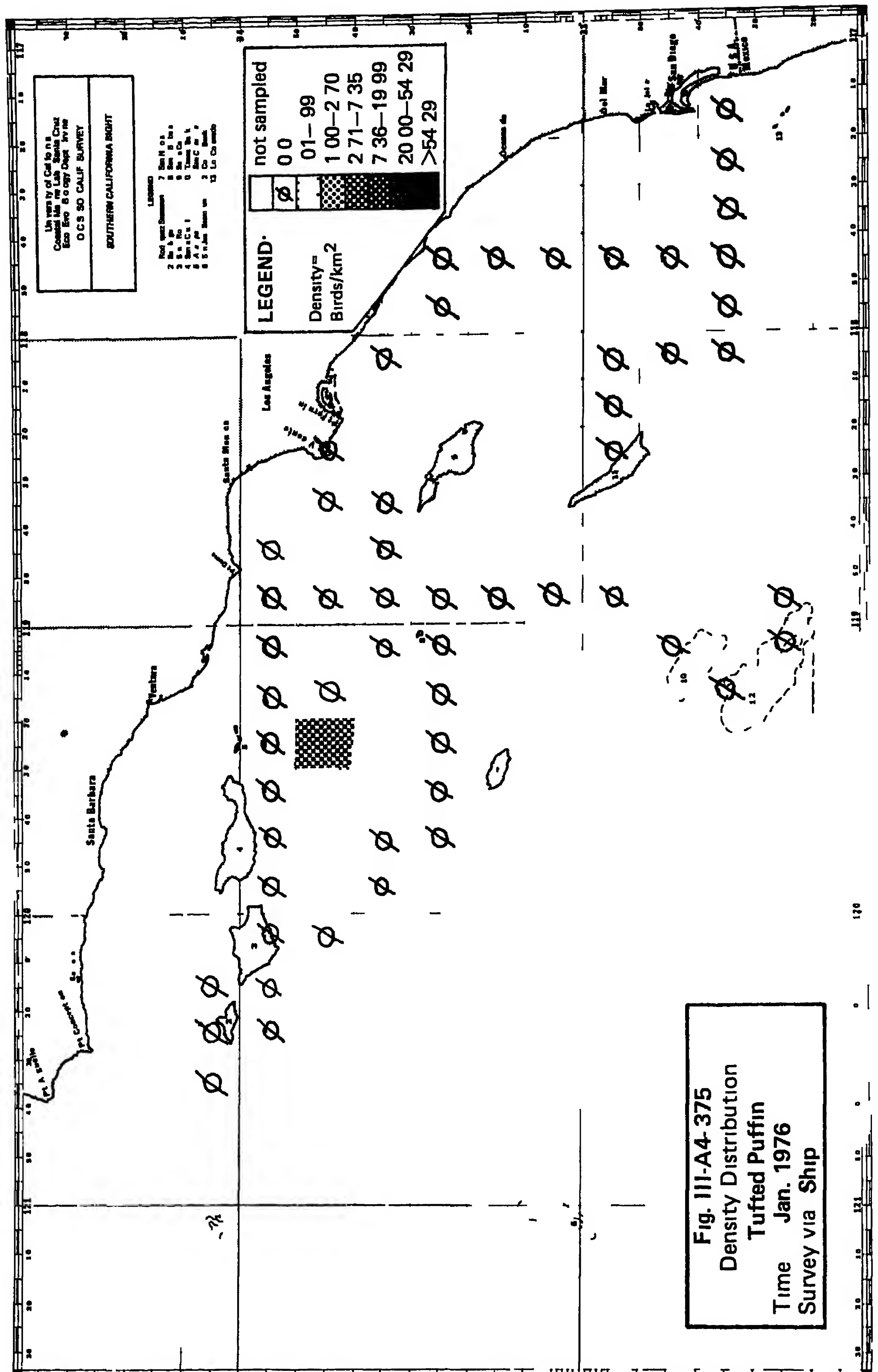
June 1975. A single bird, probably of this species, was sighted in Santa Barbara Channel 20 km north of Skunk Pt., Santa Rosa Is. during aerial surveys.

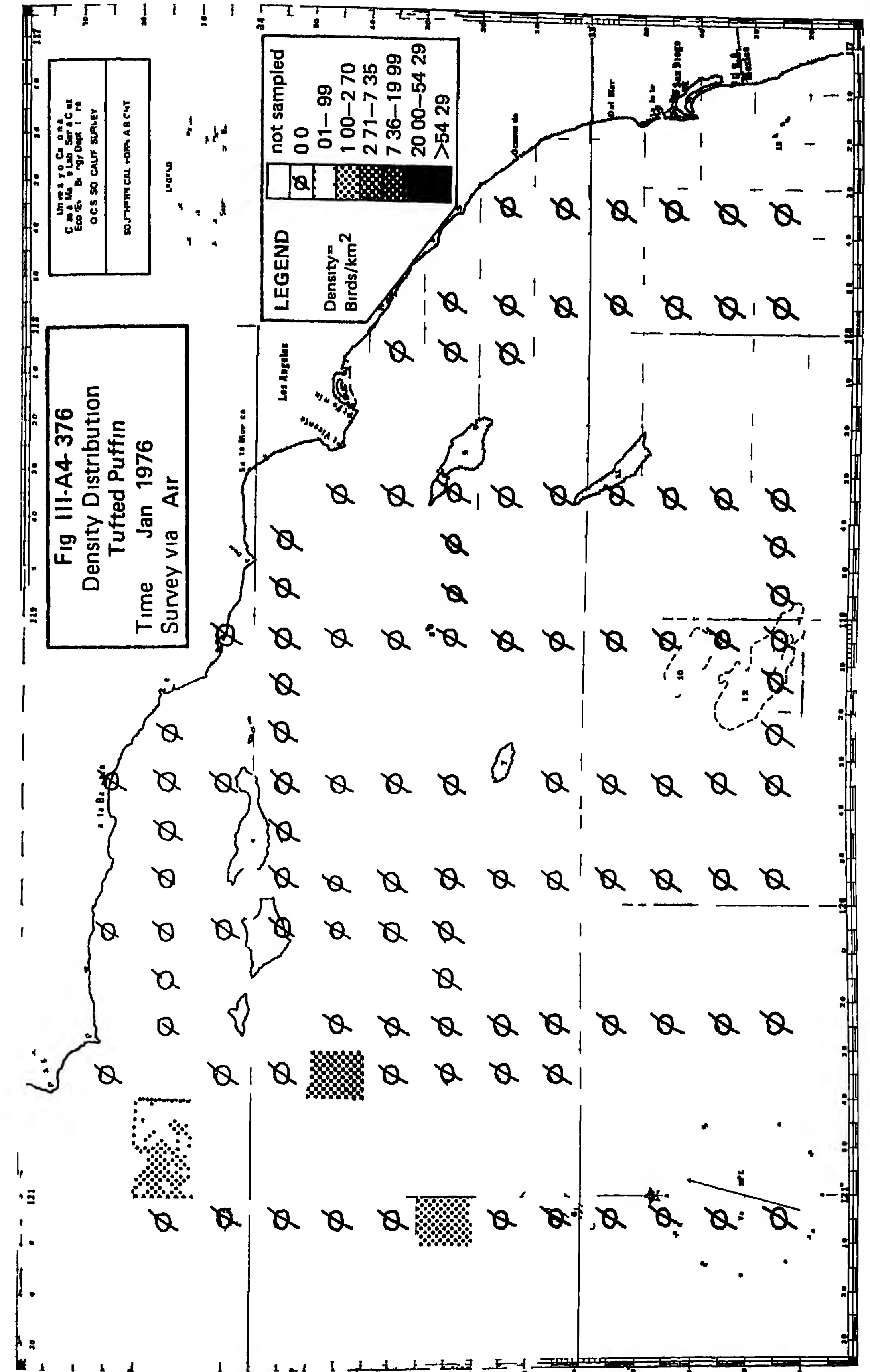
July - December 1975. None recorded.

January 1976. Twenty-three puffins were sighted during aerial and ship surveys this month (Figs. III-A4-375, 376). Fourteen were unidentified, with the remainder identified as this species. Ship surveys found these birds in moderate densities over Santa Cruz Basin. The airborne observers found them in low-moderate numbers in the regions offshore of San Miguel Is. and recorded a single bird 40 km north of San Juan Seamount.

February 1976. Two birds were seen at the south end of San Miguel Passage during ship surveys.

March 1976. A single bird found 13 km north of Prince Is. was the only sighting this month.


LEGEND
Density = Birds/km2
not sampled
0 0
01– 99
1 00–2 70
2 71–7 35
7 36–19 99
20 00–54 29
>54 29
Los Angeles
Santa Barbara
Ventura
San Diego
Fig. III-A4-375
Density Distribution
Tufted Puffin
Time Jan. 1976
Survey via Ship


LEGEND
Density = Birds/km2
not sampled
0 0
01– 99
1 00–2 70
2 71–7 35
7 36–19 99
20 00–54 29
>54 29
Los Angeles
San Diego
Del Mar
Fig III-A4-376
Density Distribution
Tufted Puffin
Time Jan 1976
Survey via Air

Horned Puffin (_Fratercula corniculata_)

Historically, the Horned Puffin has been considered a very rare or casual visitor to the coast of California, but recently an influx has been recorded (see below).

Horned Puffins are primarily birds of cold northern oceans. Their breeding range stretches from Siberia to Alaska and includes the coasts of the Bering Sea, Alaska (west of Glacier Bay) and the Aleutian Islands (Udvardy 1963). In winter they move south along the coasts of Alaska and Canada occasionally to the coast of California (Bent 1919, Hoffman et al. 1975).

The historical record for the Horned Puffin off the California coast is completely outlined by Hoffman et al. (1975). Fourteen records of dead or dying birds exist for the California coast from 1914 to 1964, but it was not until January 1966 that the first healthy bird was recorded for California (at Huntington Beach,Orange Co.). The species went unrecorded in southern California until June 1971, when one was observed 19 miles southeast of San Clemente Is. In May 1973, puffins were recorded at Santa Cruz Is. (one bird) and Santa Barbara Is. (two birds). Another bird was observed near Anacapa Is. in May 1974 (McCaskie 1974c). The geographical origin of the birds along our coast is unclear, but Hoffman et al. (1975) suggest they may be birds which have dispersed into the central Pacific and become wind-blown. Possible supporting evidence is provided by Pyle and DeLong (1968 ms) who recorded several birds in the Eastern Grid of the P.O.B.S.P.

Horned Puffins feed primarily on small fishes, but they may also take small molluscs and marine plants (Bent 1919).

Horned Puffin (continued)

1975-76 Baseline Data

April 1975. None recorded.

May 1975. Moderate densities were recorded south of San Miguel Is. at the south end of San Miguel Passage and 15 - 40 km northwest of Santa Barbara Is. (Fig. III-A4-377). A single bird was seen 8 km south of Yellowbanks, Santa Cruz Is.

June 1975. A single puffin, possibly of this species, was sighted in Santa Barbara Channel 20 km north of Skunk Pt., Santa Rosa Is. during aerial surveys.

July - December 1975. None recorded.

January 1976. Fourteen unidentified puffins were sighted during ship and air surveys this month (see Tufted Puffin, January 1975-76 Baseline Data).

February - March 1976. None recorded.

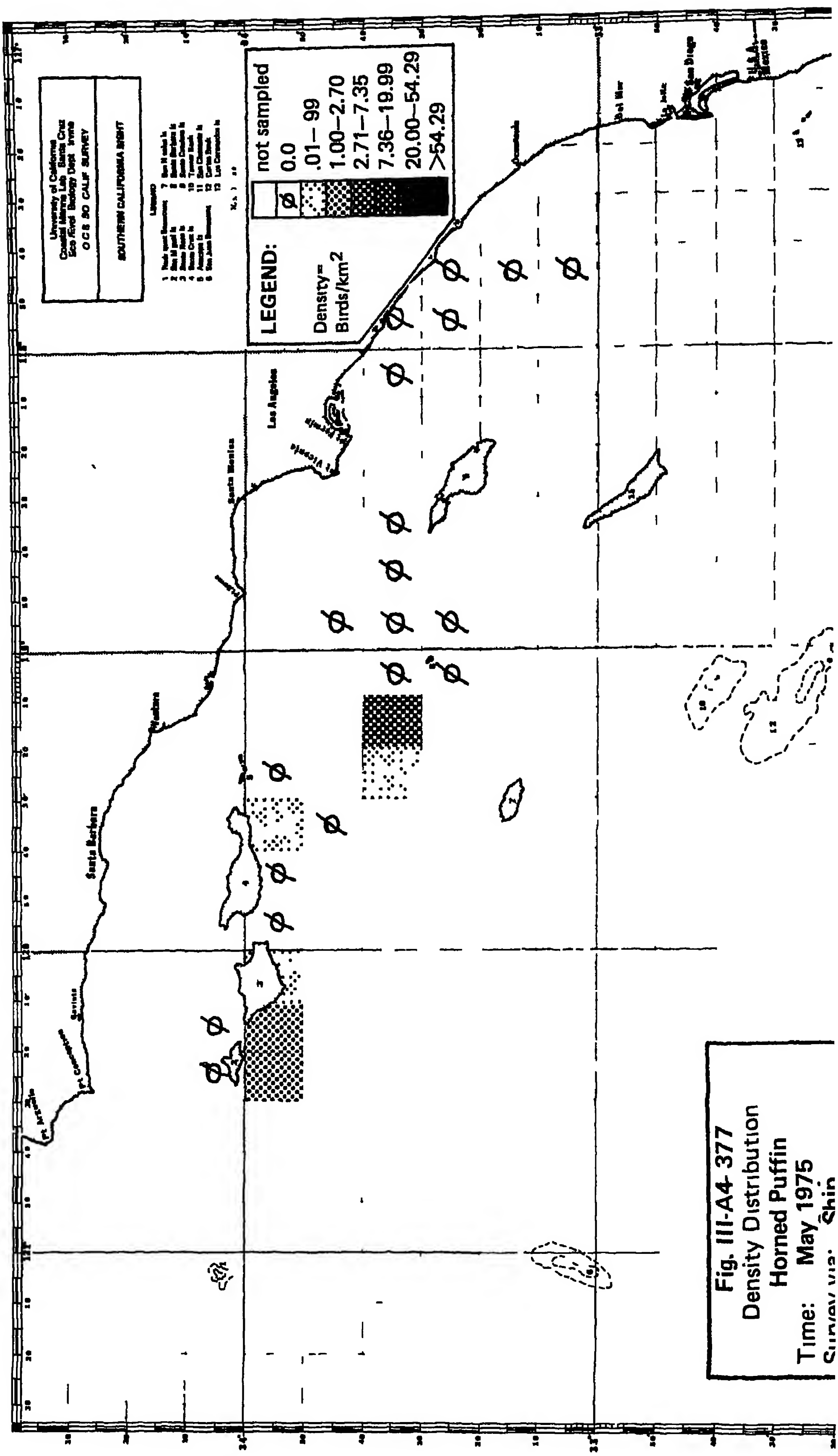


Fig. III-A4-377
Density Distribution
Horned Puffin
Time: May 1975
Survey via: Ship

APPENDIX A5
SEABIRDS:

Beach Survey Summary

D.B. Lewis

III-A5-187. Monthly summary of beached birds from all beaches, May 1975 - April 1976. Figures indicate total numbers found, followed in parentheses by numbers found with oil on plumage.

	1975								1976				
	May*	Jun*	Jul	Aug	Sep	Oct*	Nov	Dec	Jan	Feb	Mar	Apr	TOTAL
km surveyed·	52.0	52.0	55.1	55.1	55.1	49.1	55.1	55.1	55.1	55.1	55.1	55.1	649.0
Loons													
Common Loon	1(1)		1(0)				1(0)	2(1)	1(1)	1(1)			7(4)
Arctic (Pacific) Loon	4(1)	3(1)	2(1)				1(1)	3(2)	1(0)	2(0)		4(3)	20(9)
Red-throated Loon								2(1)	2(1)		2(1)		6(3)
Loon sp.	2(1)												2(1)
Grebes													
Eared Grebe		1(0)				1(1)	1(0)	1(0)	1(0)	2(1)	4(0)		11(2)
Western Grebe			1(0)				1(0)	9(4)	4(1)	10(4)	5(2)	1(0)	31(11)
Grebe sp.	1(1)							2(2)			3(0)		6(3)
Tubenoses													
Northern Fulmar	1(0)	1(0)					1(0)	6(1)	3(0)	49(21)	111(31)	43(16)	215(69)
Pink-footed Shearwater					1(0)								1(0)
Sooty Shearwater	15(2)	22(3)	47(21)	12(5)	9(6)	2(2)	1(0)	3(2)				6(1)	117(42)
Short-tailed Shearwater	1(0)	1(0)									1(0)		3(0)
Shearwater sp					1(0)					1(0)			2(0)
Ashy Storm-Petrel												1(0)	1(0)
Pelicans													
Brown Pelican	1(0)		3(0)	2(0)	1(1)	1(1)			2(0)			1(0)	11(2)
Cormorants													
Double-crested Cormorant						1(0)							1(0)
Brandt's Cormorant	2(0)	2(0)	1(0)	1(0)	5(0)	2(0)	1(0)	3(2)	2(0)	4(0)	1(0)		24(2)
Pelagic Cormorant						1(0)	2(0)	4(2)					7(2)
Cormorant sp		2(0)					1(0)	1(1)	1(1)		1(1)	1(0)	7(3)
Black-crowned Night Heron			1(0)	2(0)									3(0)
Waterfowl													
Black Brant										1(0)			1(0)
Pintail							3(0)	1(0)	2(0)				6(0)
Green-winged Teal								3(0)	2(0)				5(0)
Cinnamon Teal					1(0)						1(1)		2(1)
Northern Shoveler								1(0)					1(0)
Canvasback								1(0)					1(0)
White winged Scoter					1(0)								1(0)
Surf Scoter			1(0)	1(0)	2(0)			2(1)	4(0)	3(2)	3(1)	2(0)	18(4)
Ruddy Duck								1(0)	1(0)	2(0)			4(0)
Red breasted Merganser										1(0)		1(0)	2(0)
Duck sp									1(0)				1(0)
American Coot							3(0)	2(1)			1(0)		6(1)
Shorebirds													
Western Sandpiper												1(1)	1(1)
Whimbrel												2(0)	2(0)
Black Oystercatcher								1(1)					1(1)
Black bellied Plover							1(1)						1(1)
Willet							2(1)	2(1)	2(0)				6(2)
Red Phalarope												2(0)	2(0)
Jaegers													
Parasitic Jaeger								2(2)					2(2)
Gulls and Terns													
Western Gull	16(0)	13(0)	20(0)	9(0)	26(9)	6(3)	2(0)	7(1)	5(0)	5(0)	7(2)	8(1)	124(16)
Herring Gull							1(0)				4(1)	1(0)	6(1)
California Gull	3(0)		4(0)			1(0)	1(0)	4(2)	2(0)	4(0)	5(1)	3(2)	27(5)
Ring billed Gull			1(0)		1(0)			1(0)		1(0)			4(0)
Bonaparte's Gull												1(0)	1(0)
Heermann's Gull				1(0)	2(0)	1(0)		1(0)					5(0)
Black legged Kittiwake								2(0)	2(2)	12(5)	72(20)	21(3)	109(30)
Gull sp	1(0)	3(0)		1(0)	4(0)			3(3)			1(0)	1(0)	14(3)
Forster's Tern									1(0)				1(0)
Tern sp								2(1)					2(1)
Alcids													
Common Murre		1(0)				2(2)	1(1)	2(2)		5(3)	4(3)	1(1)	16(12)
Pigeon Guillemot					1(0)							1(1)	2(1)
Xantus Murrelet	2(0)	1(0)	1(0)	2(1)									6(1)
Craveri's Murrelet										1(1)			1(1)
Ancient Murrelet									1(1)				1(1)
Murrelet sp		1(0)			1(0)								2(0)
Cassin's Auklet			1(0)										1(0)
Rhinoceros Auklet	3(1)	1(0)							1(1)	4(2)	3(3)		12(7)
Tufted Puffin										1(1)			1(1)
Alcid sp									1(1)				1(1)
Bird sp.										1(1)		2(1)	3(2)
TOTALS	53(7)	52(4)	84(22)	31(6)	56(16)	18(9)	24(4)	74(33)	42(9)	110(42)	229(67)	104(30)	877(249)
No. of Species	12	10	13	8	13	10	16	26	19	19	16	19	49

* PMIC not sampled in May and June 1975; Santa Cruz Island North and West surveys incomplete in October 1975.

III-A5-188. Regional summary of beached birds, May 1975-April 1976. Figures indicate total numbers found, followed in parentheses by numbers found with oil on plumage. See Figure III-149 for key to beach locations.

	SANTA CRUZ ISLAND				MAINLAND North			MAINLAND Central			MAINLAND South				
	North	West	South	Total	MoG	PMTC	PtM	PDR	Hun	SOn	SoC	SSd	BFd	Total	TOTAL
km surveyed, per mo.	4.3	4.2	5.7	14.2	3.0	3.1	3.3	5.6	3.3	5.0	9.3	5.7	2.6	40.9	55.1
total	48.0	48.0	68.4	164 4	36.0	31.0	39.6	67.2	39.6	60.0	111.6	68.4	31.2	484.6	649.0
<u>Loons</u>															
Common Loon	1(1)	2(2)		3(3)		2(0)					1(0)	1(1)		4(1)	7(4)
Arctic (Pacific) Loon	4(2)	2(1)	2(0)	8(3)	1(1)	1(0)	3(1)	1(1)		3(2)	1(0)	2(1)		12(6)	20(9)
Red-throated Loon	2(2)			2(2)			2(0)	2(1)						4(1)	2(1)
Loon sp	2(1)			2(1)											
<u>Grebes</u>															
Eared Grebe		1(1)	1(0)	2(1)			1(0)	2(1)		1(0)	2(0)	1(0)	2(0)	9(1)	11(2)
Western Grebe	3(2)			3(2)	1(1)	13(6)	6(2)	2(0)			2(0)	4(0)		28(9)	31(11)
Grebe sp.	3(2)			3(2)		1(1)					1(0)	1(0)		3(1)	6(3)
<u>Tubenoses</u>															
Northern Fulmar	31(19)	14(11)	1(0)	46(30)	11(4)	11(2)	2(1)	22(12)	23(6)	7(4)	34(4)	42(5)	17(1)	169(39)	215(69)
Pink-footed Shearwater											1(0)			1(0)	1(0)
Sooty Shearwater	17(9)	2(2)	4(0)	23(11)	27(15)	5(2)	2(0)	10(3)	12(0)	3(0)	5(0)	18(8)	12(3)	94(31)	117(42)
Short-tailed Shearwater		1(0)		1(0)				1(0)	1(0)					2(0)	3(0)
Shearwater sp.	2(0)			2(0)											2(0)
Ashy Storm-Petrel						1(0)								1(0)	1(0)
<u>Pelicans</u>															
Brown Pelican	3(1)			3(1)	1(1)	1(0)		1(0)				5(0)		8(1)	11(2)
<u>Cormorants</u>															
Double-crested Cormorant		1(0)													1(0)
Brandt's Cormorant	6(2)	5(0)	3(0)	1(0)			3(0)			1(0)	1(0)	5(0)		10(0)	24(2)
Pelagic Cormorant	5(2)	2(0)		7(2)											7(2)
Cormorant sp.	3(3)		1(0)	4(3)	2(0)						1(0)			3(0)	7(3)
Black-crowned Night Heron												3(0)		3(0)	3(0)
<u>Waterfowl</u>															
Black Brant												1(0)		1(0)	1(0)
Pintail		1(0)		1(0)		4(0)	1(0)							5(0)	6(0)
Green-winged Teal						4(0)	1(0)							5(0)	5(0)
Cinnamon Teal							1(1)					1(0)		2(1)	2(1)
Northern Shoveler						1(0)								1(0)	1(0)
Canvasback						1(0)								1(0)	1(0)
White-winged Scoter		1(0)		1(0)											1(0)
Surf Scoter	2(1)	1(1)		3(2)		8(1)	1(0)	2(0)				2(0)	2(1)	15(2)	18(4)
Ruddy Duck					1(0)	3(0)								4(0)	4(0)
Red-breasted Merganser	1(0)			1(0)								1(0)		1(0)	2(0)
Duck sp						1(0)								1(0)	1(0)
American Coot					1(0)	4(1)		1(0)						6(1)	6(1)
<u>Shorebirds</u>															
Western Sandpiper						1(1)								1(1)	1(1)
Whimbrel								2(0)						2(0)	2(0)
Black Oystercatcher	1(1)			1(1)											1(1)
Black-bellied Plover					1(1)									1(1)	1(1)
Willet	1(1)			1(1)		1(0)	1(1)	1(0)	1(0)		1(0)			5(1)	6(2)
Red Phalarope								1(0)				1(0)		2(0)	2(0)
<u>Jaegers</u>															
Parasitic Jaeger	1(1)			1(1)	1(1)									1(1)	2(2)
<u>Gulls and Terns</u>															
Western Gull	16(1)	18(1)		34(2)	25(9)	7([illegible])	6(1)	1[illegible](0)	9(2)	8(0)	7(0)	10(0)	6(0)	90(14)	124(16)
Herring Gull	1(1)			1(1)		1(0)				1(0)	1(0)	2(0)		5(0)	6(1)
California Gull	5(4)	1(0)		6(4)		1(0)	1(0)	5(0)	6(1)		6(0)	1(0)	1(0)	21(1)	27(5)
Ring-billed Gull						1(0)		1(0)	2(0)					4(0)	4(0)
Bonaparte's Gull												1(0)		1(0)	1(0)
Heermann's Gull			1(0)	1(0)	1(0)			2(0)					1(0)	4(0)	5(0)
Black-legged Kittiwake	7(6)	6(3)		13(9)	[illegible](0)	[illegible]([illegible])	4(1)	4([illegible])	6([illegible])	[illegible](0)	28(8)	30(3)	9(2)	96(19)	109(30)
Gull sp	4(3)	6(0)		10(3)			1(0)				1(0)	2(0)		4(0)	14(3)
Forster's Tern					1([illegible])									1(0)	1(0)
Tern sp	2(1)			2(1)											2(1)
<u>Alcids</u>															
Common Murre	5(3)	3(2)	1(1)	9(6)	3(1)	2(1)	1(1)		1(1)					7(6)	16(12)
Pigeon Guillemot	2(1)			2(1)											2(1)
Xantus' Murrelet						1(1)	1(0)	1(0)					3(0)	6(1)	6(1)
Craveri's Murrelet	1(1)			1(1)											1(1)
Ancient Murrelet					1(1)									1(1)	1(1)
Murrelet sp.	1(0)	1(0)		2(0)											2(0)
Cassin's Auklet							1(0)							1(0)	1(0)
Rhinocerous Auklet	5(5)	4(2)		9(7)			1(0)		1(0)				1(0)	3(0)	12(7)
Tufted Puffin	1(1)			1(1)											1(1)
Alcid sp	1(1)			1(1)											1(1)
Bird sp.	1(1)			1(1)			1(0)						1(1)	2(1)	3(2)
TOTALS	140(79)	72(26)	14(1)	226(106)	80(37)	84(21)	41(9)	73(20)	62(12)	29(6)	93(12)	134(18)	55(8)	651(143)	877(249)
No. of Species	25	18	7	31	16	24	19	19	10	8	13	19	10	42	49

VOLUME III

Master List of Literature Citations

›ott, C. G. 1930. California record of a sharp-headed finner whale. Jour. of Mammal. 11(2): 240-241. [III-Ceta]

ıms, L. 1968. Census of the grey whale, 1966-67. Norsk Hvalfangst-Tidende 57(4): 41-43. [III-Ceta]

ıley, D. G. 1972. Brown Pelicans in north-central coastal California. Calif. Birds 3: 59-64. [III-Bird)

ıley, D. G. and T. J. Lewis. 1974. The history of Farallon Island marine bird populations, 1854-1972. Condor 76: 432-446. [III-Pinn]

ıley, D. G., S. Morrell and T. J. Lewis. 1975. Patterns in the life histories of Storm Petrels on the Farallon Islands. Living Bird 13: 295-312. [III-Bird]

ıley, D. G., T. J. Lewis and S. Morrell. 1976. Molt in Leach's and Ashy Storm-Petrels. Wilson Bull. 88: 76-95. [III-Bird]

ıley, D. G. and T. J. Lewis. 1974. The history of Farallon Island marine bird populations, 1854-1972. Condor 76: 432-446. [II, III-Bird]

lrich, E. C. 1938. A recent oil pollution and its effects on the water birds of the San Francisco Bay area. Bird Lore 40: 110-114. [II, III-Bird]

lrich, J. W. 1970. Review of the problems of birds contaminated by oil and their rehabilitations. U.S. Dep. Int., Bur. SportFish. Wildl. Res. Publ. 87: 1-23. [II-Bird]

en,

›rican Ornithologists' Union. 1957. Check-list of North American birds. Fifth ed. American Ornithologists' Union, Washington, D.C. [III-Bird]

›rican Ornithologists' Union. 1973. Thirty-second supplement to the A.O.U. check-list of North American birds (1957, fifth ed.) Auk 90: 411-419. [III-Bird]

lerson, D. W. and I. T. Anderson. 1976. Distribution and status of Brown Pelicans in the California Current. Amer. Birds 30: 3-12. [II, III-Bird]

lerson, D. W. and J. J. Hickey. 1970. Oological data on egg and breeding characteristics of Brown Pelicans. Wilson Bull. 82: 14-28. [III-Bird]

Anderson, D. W., J. R. Jehl, Jr., R. W. Risebrough, L. A. Woods, Jr., L. R. DeWeese and W. G. Edgecomb. 1975. Brown Pelicans: improved reproduction off the southern Calif. coast. Science 190: 806-808. [III-Bird]

Anderson, D. W., R. M. Jurek and T. O. Keith. 1977. The status of Brown Pelicans at Anacapa Island in 1975. Calif. Fish and Game. In press. [III-Bird]

Anderson, D. W., R. W. Risebrough, D. F. Hughes and R. E. Christenson. 1969. Significance of chlorinated hydrocarbon residues to breeding pelicans and cormorants. Can. Field-Nat. 83: 93-112. [II, III-Bird]

Andersson, M. 1976. Predation and kleptoparasitism in Skuas in a Shetland seabird colony. Ibis 118: 208-217. [II, III-Bird]

Anthony, A. W. 1898. Petrels of southern California. Auk 15: 140-144. [III-Bird]

Appy, R. G. 1974. The air sinus flukes, genus Nasitrema (Trematoda: Nasitrematidae), In Porpoises from the Eastern Pacific. Unpubl. masters thesis, California State University, Long Beach. [III-Para]

Ashmole, N. P. 1971. Sea bird ecology and the marine environment. In D. S. Farner and J. R. King (eds.), Avian biology, vol. 1. Academic Press, New York. [III-Bird]

Austin, O. L. and N. Kuroda. 1953. The birds of Japan. Bull. Mus. Comp. Zool., Harv. Coll. 109: 280-637. [III-Bird]

Badger, W. C. 1917. A trip to Anacapa Island, Ventura County, Calif. Oologist 34: 189. [III-Bird]

Baker, R. C., F. Wilke and C. H. Baltzo. 1970. The northern fur seal. U.S. Dept. of Int., Fish and Wildl. Serv., Washington, D.C. Circ. 336. 19 pp. [III-Pinn]

Bailey, E. P. and G. H. Davenport. 1972. Die-off of Common Murres on the Alaska Peninsula and Unimak Island. Condor 74: 215-219. [III-Bird]

Baldridge, A. 1973. The status of the Brown Pelican in the Monterey region: past and present. Western Birds 4: 93-100. [III-Bird]

Baldridge, A. 1974. Migrant grey whales with calves and sexual behavior of grey whales in the Monterey area of central California, 1967-1973. Fishery Bull. vol. 72(2). [III-Ceta]

Banfield, A. W. F. 1974. The Mammals of Canada, Univ. of Toronto Press. pp. 238-285. [III-Ceta]

Banks, R. 1966. Terrestrial vertebrates of Anacapa Islands, Calif. San Diego Soc. Nat. Hist., Trans. 14: 173-188. [II, III-Bird]

Bartholomew, G. A., Jr. 1942. The fishing activities of Double-crested Cormorants on San Francisco Bay. Condor 44: 13-21. [III-Bird]

Bartholomew, G. A. 1950a. Reoccupation by the elephant seal of Los Coronados Islands, Baja California, Mexico. Jour. of Mammal. 31(1): 98. [III-Pinn]

Bartholomew, G. A. 1950b. A male Guadalupe fur seal on San Nicolas Island, California. Jour. of Mammal. 31: 175-180. [III-Pinn]

Bartholomew, G. A. 1951. Spring, summer and fall censuses of the pinnipeds on San Nicolas Island, California. Jour. of Mammal. 32(1): 15-21. [III-Pinn]

Bartholomew, G. A. 1952. Reproductive and social behavior of the northern elephant seal. Univ. Calif., Publ. Zool. 47: 369-472. [III-Pinn]

Bartholomew, G. A. 1959. Mother-young relations and the maturation of pup behavior in the Alaska fur seal. Anim. Behav. 7(3-4): 163-171. [III-Pinn]

Bartholomew, G. A. 1967. Seal and sea lion populations of the California Islands. In Proc. Symp. Biol. Calif. Is., held at Santa Barbara Botanic Garden, 1965. Santa Barbara, Calif. pp. 229-244. [III-Pinn]

Bartholomew, G. A. 1970. A model for the evolution of pinniped polygyny. Evolution 24: 546-559. [III-Pinn]

Bartholomew, G. A. and R. A. Boolootian. 1960. Population structure of the pinnipeds on the Channel Islands, Calif. Jour. of Mammal. 41: 366-375. [III-Pinn]

Bartholomew, G. A., R. D. Collyer and W. R. Dawson. 1951. The sea lion population of Santa Barbara Island, California, in the 1950 breeding season. Calif. Fish and Game 37: 65-68. [III-Pinn]

Bartholomew, G. A. and P. G. Hoel. 1953. Reproductive behavior of the Alaska fur seal, Callorhinus ursinus. Jour. of Mammal. 34(4): 417-436. [III-Pinn]

Bartholomew, G. A. and C. L. Hubbs. 1952. Winter population of pinnipeds about Guadalupe, San Benito and Cedros Island, Baja California. Jour. of Mammal. 33: 160:171. [III-Pinn]

Bartholomew, G. A. and C. L. Hubbs. 1960. Population growth and seasonal movements of the northern elephant seal, Mirounga angustirostris. Mammalia 24: 313-323. [III-Pinn]

Beck, R. H. 1899. Additional notes on the birds of Santa Cruz Island, California. Condor 1: 85-86. [III-Bird]

Bedard, J. 1969. Feeding of Least, Crested and Parakeet Auklets around St. Lawrence Island, Alaska. Can. J. Zool. 47: 1025-1050. (III-Bird]

Bedard, J. 1976. Coexistence, coevolution and convergent evolution in seabird communities: a comment. Ecology 57: 177-184. [III-Bird]

Bender, K. E., C. T. Collins and S. L. Warter. 1974. Marine and shore birds. In M. D. Dailey (ed.), A summary of knowledge of the southern California coastal zone and offshore areas. 2. Biological environment. U. S. Dept. of the Interior, Washington, D. C. pp. 13-1 to 13-103. [III-Bird]

Bent, A. C. [1919] 1963. Life histories of North American diving birds (unaltered reprint of Smithson. Inst. Bull. 107). Dover Publications, Inc., New York. 239 pp. [III-Bird]

Bent, A. C. [1921] 1963. Life histories of North American gulls and terns (unaltered reprint of Smithson. Inst. Bull. 113). Dover Publications Inc., New York. 337 pp. [III-Bird]

Bent, A. C. [1922] 1964. Life histories of North American petrels and pelicans and their allies (unaltered reprint of Smithson. Inst. Bull. 121). Dover Publications Inc., New York. 335 pp. [III-Bird]

Bibby, D. J. and Bourne, W. R. P. 1971. More problems for threatened birds. Birds 3 (12). [III-Bird]

Bigg, M. A. 1969a. Clines in pupping season of the harbor seal. Phoca vitulina. J. Fish. Res. Bed. Can. 26(2): 449-455. [III-Pinn]

Bigg, M. A. 1969b. The harbour seal in British Columbia. Bull. Fish. Res. Bd. Can. 172. 33 pp. [III-Pinn]

Bigg, M. A. 1973. Census of California sea lions on southern Vancouver Island, British Columbia. J. Mammal. 54:285-287. [III-Pinn]

Bigg, M. A. and H. D. Fisher. 1975. Effect of photo period on annual reproduction in female harbour seals. Rapp. P.-v. Re'un. Cons. int. Explor. Mer 169: 141-144. [III-Pinn]

Bishop, R. H. 1968. Reproduction, age determination and behavior of the harbor seal, Phoca vitulina l. in the Gulf of Alaska. Univ. of Alaska, M. Sc. Thesis. 121 pp. [III-Pinn]

Blake, E. W., Jr. 1887. Summer birds of Santa Cruz Island, Calif. Auk 4: 328-330 [III-Bird]

Bodle, J. E. 1969. Mortality of Common Murres along the northern California coast. Calif. Fish and Game 55: 329-330. [III-Bird]

Bolton, H. E. 1916. Spanish exploration in the Southwest, 1542-1706. Charles Scribner's Sons, New York, 487 pp. [III-Pinn]

Bond, S. I. 1971. Red Phalarope mortality in southern California. Calif. Birds 2: 97. [III-Bird]

Bonnell, M. L. 1975. June census of pinnipeds on Islas Los Coronados. Unpubl. expedition report, Univ. Calif., Santa Cruz. 3 pp. [III-Pinn]

Bonnell, M. L. and M. O. Pierson. 1970. Report of Scripps Institution of Oceanography Expedition MV 70-IV to Northwest Baja California Islands. Pinniped investigations. Unpublished expedition report, Univ. Calif. Santa Cruz. 19 pp. [III-Pinn]

Bonnell, M. L. and R. K. Selander. 1974. Elephant seals: genetic variation and near extinction. Science 184: 908-909. [III-Pinn]

Bonner, W. N. and S. R. Witthames. 1974. Dispersal of common seals (Phoca vitulina) tagged in the Wash, East Anglia. J. Zool. 174(3): 528-531. [III-Pinn]

Bonnot, P. 1928a. Report on the seals and sea lions of California. Fish Bull. 14, Calif. Div. Fish and Game. 62 pp. [III-Pinn]

Bonnot, P. 1928b. The sea lions of California. Calif. Fish and Game. 14(1): 1-16. [III-Pinn]

Bonnot, P. 1931. The California sea lion census for 1930. Calif. Fish and Game 17: 150-155. [III-Pinn]

Bonnot, P. 1937. California sea lion census for 1936. Calif. Fish and Game 23: 108-112. [III-Pinn]

Bonnot, P. 1951. The sea lions, seals and sea otter of the Calif. coast. Calif. Fish and Game 37(4): 371-389. [III-Pinn]

Bonnot, P., G. H. Clark and S. R. Hatton. 1938. California sea lion census for 1938. Calif. Fish and Game 24: 415-419. [III-Pinn]

Bonnot, P. and E. Ripley. 1948. The California sea lion census for 1947. Calif. Fish and Game 34: 89-92. [III-Pinn]

Boulva, J. 1971. Observations on a colony of whelping harbour seals, Phoca vitulina concolor, on Salde Island, Nova Scotia. J. Fish. Res. Bd. Can. 28(5): 755-759. [III-Pinn]

Boulva, J. 1975. Temporal variations in birth period and characteristics of newborn harbour seals. Rapp. P.-v. Re'un. Cons. int. Explor. Mer. 169: 405-408. [III-Pinn]

Bourne, W. R. P. 1956. Migrations of the Sooty Shearwater. Sea Swallow 13: 26-36. [III-Bird]

Bourne, W. R. P. 1968. Observations of an encounter between birds and floating oil. Nature 219: 632. [III-Bird]

Bourne, W. R. P. 1967. Long-distance vagrancy in the petrels. Ibis 109: 141-167. [III-Bird]

Bourne, W. R. P. 1968. Oil pollution and bird populations. In J. D, Carthy and D. R. Arthur, (eds.). The biological effects of oil pollution of littoral communities. Field studies, suppl. to vol. 2. Field Studies Council, London. pp. 99-121 [II, III-Bird]

Bourne, W. R. P. 1970. After the Torrey Canyon disaster. Ibis 112: 120-25. [III-Bird]

Bourne, W. R. P. and T. R. E. Devlin. 1969. Birds and oil. Birds 2: 176-178. [III-Bird]

Bourne, W. R. P. and T. R. E. Devlin. 1970. International beached bird survey, 1969. Birds 3: 12-13. [III-Bird]

Bourne, W. R. P. and T. R. E. Devlin. 1971. The pollution plot thickens. Birds 3: 190-192, 207. [III-Bird]

Braham, H. W. 1974. The California sea lion on islands off the coast of San Luis Obispo County, California. Calif. Fish and Game 60(2): 79-83. [III-Pinn]

Briggs, K. T. and C. W. Davis. 1972. A study of predation by sea lions on salmon in Monterey Bay. Calif. Fish and Game 58(1): 37-43 [III-Pinn]

Brown, D. H., D. K. Caldwell and M. C. Caldwell. 1966. Observations on the behavior of wild and captive false killer whales, with notes on associated behavior of other genera of captive delphinids, Los Angeles County Museum - Contributions in Science No. 95: 2-32. [III-Ceta]

Brown, D. H. and K. S. Norris. 1956. Observations of captive and wild cetaceans. Jour. of Mammal. 37(3): 311-326. [III-Ceta]

Brown, R. G. B., R. Cooke, P. K. Kinnear and E. L. Mills. 1975. Summer seabird distribution in Drake Passage, the Chilean Fijords and off southern South America. Ibis 117: 334-356. [III-Bird]

Brownell, R. L., Jr. and R. L. De Long. 1968. Marine mammals of the eastern gird area. Unpubl. report prepared for Pacific Ocean Biological Survey program, Smithsonian Institution, Washington, D.C. 10 pp. [III-Pinn]

Brownell, R. L., Jr., R. L. De Long and R. W. Schreiber. 1974. Pinniped population at Islas de Guadalupe, San Benito, Cedros and Natividad, Baja California, in 1968. J. Mammal. 55: 469-472. [III-Pinn]

Brownell, R. L. and B. J. Le Boeuf. 1971. California sea lion mortality natural or artifact? In D. Straughan (ed.), Biological and oceanographical survey of the Santa Barbara Channel oil spill, 1969-1970. Univ. Sou. Calif., Allan Hancock Foundation, vol. 1: 287-300. [III-Pinn]

Burns, J. J. 1970. Remarks on the distribution and natural history of pagophilic pinnipeds in the Bering and Chukchi Seas. J. Mammal. 51(3): 445-454. [III-Pinn]

Burns, J. J. and F. H. Fay. 1972. Comparative biology of Bering Sea harbor seal populations. In, Science in Alaska Proc. 23rd Alaskan Sci. Conf., Aug. 1972. Fairbanks, Alaska. [III-Pinn]

Burt, H. C. 1911. An early spring trip to Anacapa Island. Condor 13: 164-167. [III-Bird]

Butterworth, B. B. 1957. Phocoenoides dalli washed ashore in California. Jour. of Mammal. 38(1): 126. [III-Ceta]

Bychkov, V. A. and S. V. Dorofeev. 1962. On the behavior of fur seal bulls during the harem period. Zoologicheskii Zhurnal 41(9): 1433-1435. [III-Pinn]

Carlisle, John G. Jr. 1973. The census of northern elephant seals on San Miguel Island, 1965-1973. Calif. Fish and Game 59(4): 311-313. [III-Pinn]

Carlisle, J. G. and J. A. Aplin. 1966. Sea lion census for 1965, including counts of other California pinnipeds. Calif. Fish and Game 52(2): 119-120. [III-Pinn]

Carlisle, J. G. and J. A. Aplin. 1971. Sea lion census for 1970, including counts of other California pinnipeds. Calif. Fish and Game 57(2): 124-126. [III-Pinn]

Chapman, D. G. 1964. A critical study of Pribilof fur seal population estimates. U. S. Fish Wildl. Serv., Fish. Bull. 63(3): 657-669. [III-Pinn]

Christenson, T. E. 1974. Aggressive behavior of the female northern elephant seal. Ph. D. dissertation. University of California, Berkeley, California [III-Pinn]

Clark, R. B. 1973. Impact of chronic and acute oil pollution on seabirds. In, Background papers for a workshop on inputs, fates, and effects of petroleum in the marine environment. Ocean Affairs Board, National Academy of Sciences, Washington, D. C. pp. 619-634. [II, III-Bird]

Cody, M. 1973. Coexistence, coevolution and convergent evolution in seabird communities. Ecology 54: 31-44. [III-Bird]

Connell, J. H. 1971. A review of: Straughan, D.1971. Biological and oceanographical survey of the Santa Barbara Channel oil spill. 1. Biology and bacteriology. Submission to the Royal Commission on oil exploitation on the Great Barrier Reef, Part I, pp. 1-12. [III-Bird]

Cooper, J. G. 1870. The fauna of California and its geographical distribution. Proc. Calif. Acad. Sci., Ser. 1 Zool. 4: 61-81. [III-Bird]

Cotton, C. 1939. Food habits of North American diving ducks, U. S. Dept. Agric. Tech. Bull. 643: 1-140. [III-Bird]

Coulson, J. C. and M. G. Brazendale. 1968. Movements of cormorants ringed in the British Isles and evidence of colony-specific dispersal. Brit. Birds 61: 1-21. [II, III-Bird]

Coulter, M. C. 1975. Post-breeding movements and mortality in the Western Gull, Larus occidentalis. Condor 77: 243-249. [III-Bird]

Coulter, M. C. and R. W. Risebrough. 1973. Shell-thinning in eggs of the Ashy Petrel (Oceanodroma homochroa) from the Farallon Islands. Condor 75: 254-255. [III-Bird]

Countryman, D. A. and C. L. Hubbs. 1976. Report of an expedition to Islas Los Coronados, Mexico, 27 January 1976. Univ. Calif. San Diego, expedition report. 4 pp. [III-Pinn]

Cox, C. R. and B. J. Le Boeuf. 1976. Female incitation of male competition: A mechanism in sexual selection. The American Naturalist (in press). [III-Pinn]

Craig, A. M. 1964. Histology of reproduction and the estrus cycle in the female fur seal, Callorhinus ursinus. J. Fish. Res. Bd. Can. 21: 773-811. [Pinn]

Craig, A. M. 1971. Survey of California Least Tern nesting sites. Calif. Dep. Fish Game, Wildl. Manage. Bur. Admin. Rep. [III-Bird]

Crossin, R. S. 1974. The Storm Petrels (Hydrobatidae). In W. B. King (ed.), pelagic studies of seabirds in the central and eastern Pacific Ocean. Smithson. Contrib. Zool. 158: 154-205. [III-Bird]

Cuthbert, F. S. and W. E. Southern. 1973. Ring-billed Gull relocates nest as a result of egg displacement. Bird-banding 44: 225-227. [III-Bird]

Dailey, M. 1970. The transmission of Parafilaroides decorus (Nematoda: Metastrongyloidae) in the California sea lion (Zalophus californianus). Proc. Helm Soc. Wash. 37: 215-222. [III-Para]

Dailey, M. D. 1970. The transmission of Parafilaroides decorus. (Nematoda: Metastrongyloidea) in the California sea lion (Zalophus californianus). Helmin. Soc., Wash., Proc. 37: 215-222. [III-Pinn]

Dailey, M. D. 1971. Distribution of helminths in the Dall's Porpoise (Phocoenoides dalli True). J. Parasit. 57: 1348 [III-Para]

Dailey, Murray D. 1974. Marine Mammals. Reprinted from A Summary of Knowledge of the Southern California Coastal Zone and Offshore Areas. Southern California Ocean Studies Consortium. Bureau of Land Management Contract No. 08550-CT4-1. [III-Ceta]

Dailey, M. D. and R. W. Brownell, Jr. 1972. A checklist of Marine Mammal Parasites. In Mammals of the Sea: Biology and Medicine, S. H. Ridgway, Ed., Thomas, Springfield, Ill. pp. 528-589. [III-Para]

Dailey, M. D. and B. L. Hill. 1970. A survey of metazoan parasites infecting the California (*Zalophus californianus*) and Steller (*Eumatopias jubatus*) sea lion. 1970. Bull. So. Calif. Acad. Sci. 69: 126-132. [III-Para]

Dailey, M. D. and W. F. Perrin. 1973. Helminth parasites of porpoise of the genus *Stenella* in the Eastern Tropical Pacific, with descriptions of two new species: *Mastigonema stenellae* Gen. et sp. n. (Nematoda: Spiruroidea) and *Zalophotrema pacificum* sp. n. (Trematoda: Digenea). Fishery Bull. 71: 455-471. [III-Para]

Dawson, W. L. and J. H. Bowles. 1909. Birds of Washington. Occidental Printing Co., Seattle. 2 vols. [III-Bird]

De Long, R. L. 1975. San Miguel Island management plan. Unpubl. report prepared for the Marine Mammal Commission. 38 pp. [III-Pinn]

De Long, R. L. and R. S. Crossin. 1968. Eastern Pacific offshore islands. Unpubl. manuscript. Smithsonian Institution Pacific Ocean Biological Survey program, 1963-1968, Washington, D. C. [III-Bird]

De Long, R. L., W. G. Gilmartin and J. G. Simpson. 1973. Premature births in California sea lions: Association with high organochlorine pollutant residue levels. Science 181: 1168-1170. [III-Pinn]

Denis, A. J. 1927. Spanish Alta California. The Macmillan Co., New York [III-Pinn]

DeSante, D., D. A. Gaines and V. Remsen. 1973. The winter season: middle Pacific coast region. Amer. Birds 27: 656-658 [III-Bird]

Devillers, P. The South Polar Skua (*Catharacta maccormicki*) on the Pacific coast of North America. Unpubl. manuscript. [III-Bird]

Devillers, P., G. McCaskie and J. R. Jehl, Jr. 1971. The distribution of certain large gulls (*Larus*) in southern California. Calif. Birds 2: 11-26. [III-Bird]

DeWeese, L. R. and D. W. Anderson. 1976. Distribution and breeding biology of Craveri's Murrelet. San Diego Soc. Nat. Hist. Trans. 18: 155-168 [III-Bird]

Dexheimer, M. and W. E. Southern. 1974. Breeding success relative to nest location and density in Ring-billed Gull colonies. Wilson Bull. 86: 288-290. [III-Bird]

Dixon, W. J. (ed.) 1974. BMD 02R stepwise regression. In Biomedical computer programs. University of California Press, Berkeley. pp. 305-330. [III-Pinn]

Drent, R. H. 1965. Breeding biology of the Pigeon Guillemot, Cepphus columba. Ardea 53: 99-159. [III-Bird]

Eberhardt, L. L. 1968. A preliminary appraisal of line transect. J. Wildl. Management 32(1): 82-88 [III-Pinn]

Eibl -Eibesfeldt, I. 1955. Ethologische Studien am Galapagos-Seelowen Zalophus californianus wollebaeki Sivertsen. Zeit. f. Tierpsychol. 12: 286-303. [III-Pinn]

Elliot, H. W. 1882. A monograph of the seal islands of Alaska. U. S. Comm. of Fish and Fisheries, Washington, D. C. Spec. Bull. 176. 176 pp. [III-Pinn]

Emery, K. O. 1960. The sea off southern California: John Wiley and Sons, New York [II, III-Bird]

Emlen, J. T. 1971. Population densities of birds derived from transect counts. Auk 88:323-342. [III-Pinn and Bird]

Evans, W. E. 1975. Distribution, differentiation of populations, and other aspects of the natural history of Delphinus delphis Linnaeus in the Northeastern Pacific. Ph. D. dissertation. [III-Ceta]

Evans, W. E., J. D. Hall, A. B. Irvine and J. S. Leatherwood. 1972. Methods for tagging small cetaceans. Fishery Bull. 70: 61-65. [III-Ceta]

Everman, B. W. 1921. The Ano Nuevo Steller sea lion rookery. J. Mammal. 2:16-19. [III-Pinn]

Finch, V. 1966. Maternal behavior in the harbor seal. San Francisco State Univ., M.S. Thesis. 94 pp. [III-Pinn]

Fiscus, C. H., G. A. Baines and F. Wilke. 1964. Pelagic fur seal investigations, Alaska waters, 1962. U. S. Fish and Wildl. Serv., Washington, D. C., Spec. Sci. Rep. Fish. 475. 59 pp. [III-Pinn]

Fiscus, C. H. and G. A. Baines. 1966. Food and feeding behavior of Steller and California sea lions. J. Mammal. 47: 195-200. [III-Pinn]

Fiscus, C. H. and H. Kajimura. 1969. Pelagic fur seal investigations, 1966. In Fur seal investigations, 1966. U. S. Fish Wildl. Serv., Washington, D. C. Spec. Sci. Rep. Fish. 584. 123 pp. [III-Pinn]

Fiscus, C. H. and K. H. Niggol. 1965. Observations of cetaceans off California, Oregon and Washington. U. S. Fish and Wildlife Service, Spec. Scientific Report Fisheries No. 498: 1-27. [III-Ceta]

Fisher, H. D. 1952. The status of the harbour seal in British Columbia, with particular reference to the Skeena River. Fish Res. Bd. Can., Bull. 93 pp. [III-Pinn]

Fisher, Jr. 1952. The Fulmar. Collins, Lond. [III-Bird]

Follett, W. I. and D. G. Ainley. 1976. Fishes collected by Pigeon Guillemots, Cepphus columba (Pallas), nesting on Southeast Farallon Island, California. Calif. Fish and Game 62: 28-31. [III-Bird]

Fry, D. H., Jr. 1935. Sharp-headed finner whale taken in Los Angeles Harbor. Jour. of Mammal. 16(3): 205-207. [III-Ceta]

Freiberg, R. G. and P. C. Dumas. 1954. The elephant seal (Mirounga angustirostris) in Oregon. J. Mammal. 35(1): 129. [III-Pinn]

Frey, H. W. and J. A. Aplin. 1970. Sea Lion census for 1969, including counts of other California pinnipeds. Calif. Fish and Game 56(2): 130-133. [III-Pinn]

Fry, D. H. 1939. A winter influx of sea lions from Lower California. Calif. Fish and Game 25: 245-250. [III-Pinn]

Gabrielson, I. N. and F. C. Lincoln. 1959. Birds of Alaska. The Stackpole Co., Harrisburg, and the Wildlife Management Inst., Washington, D. C. [III-Bird]

Gallup, F. and B. H. Bailey. 1960. Elegant Tern and Royal Tern nesting in California. Condor 62: 65-66 [III-Bird]

Gantt, R. F., M. L. Bonnell, R. Whiting and B. J. Le Boeuf. 1971. Summary of pinniped investigations carried out during Scripps Institution of Oceanography expedition to northwest Baja California islands. Unpubl. expedition report, Univ. Calif., Santa Cruz. 16 pp. [III-Pinn]

Gates, C. E., W. H. Marshall and D. P. Olson. 1968. Line transect method of estimating grouse population densities. Biometrics 24: 135-145. [III-Pinn]

Gentry, R. L. 1968. Notes on the harbor seal (Phoca vitulina) population at Ano Nuevo Island. Univ. Calif., Santa Cruz. Ano Nuevo Reports 2: 26-29. [III-Pinn]

Gentry, R. L. 1970. Social behavior of the Steller sea lion. Univ. Calif. at Santa Cruz, Ph. D. Thesis. 113 pp. [III-Pinn]

Gentry, R. L. 1975a. Comparative social behavior of eared seals. Rapp. P.-v. Re'un. Cons. int. Explor. Mer 169: 188-194. [III-Pinn]

Gentry, R. L. 1975b. The validity of the "harem" concept in fur seals. Paper presented at the Conf. on Biol. and Cons. of Marine Mammals, 4-7, December 1975. [III-Pinn]

Gihr and Pilleri.

Gill, R. E. 1976. On the foraging distance and prey selection of nesting Caspian Terns. Calif. Fish and Game 62:155. [III-Bird]

Gilmartin, W. G., R. L. De Long, A. W. Smith, J. C. Sweeney, B. W. De Lappe, R. W. Risebrough, L. A. Griner, M. D. Dailey and D. B. Peakall. 1976. Premature parturition in the California sea lion. Journal of Wildlife Diseases 12: 104-115. [III-Pinn]

Gilmore, R. M. 1960. A census of the California gray whale. U. S. Fish and Wildlife Service, Spec. Scientific Report - Fisheries No. 342: 1-30 (Ed. D. W. Rice). [III-Ceta]

Gilmore, R. M. 1962. Bubbles and other pilot whales. Barley Brae Printers, Del Mar, California. 16 pp. [III-Ceta]

Gilmore, R. M. Oct. 1975. Pers. comm. San Diego Museum of Natural History. San Diego, California [III-Ceta]

Godfrey, W. E. 1966. The birds of Canada. Natl. Mus. Canada, Ottawa. 428 pp. [III-Bird]

Goethe, F. 1968. The effects of oil pollution on marine and coastal birds. Helgol. Wiss. Meeresunters. 17: 370-374. [III-Bird]

Gould, P. J. 1974. Introduction. <u>In</u> W. B. King (ed), Pelagic studies of seabirds in the Central and Eastern Pacific Ocean. Smithson. Contrib. Zool. 158: 1-5. [III-Bird]

Greenhalgh, C. M. 1952. Food habits of the California gull in Utah Condor 54: 302-308. [III-Bird]

Greenwood, J. J. D. and J. P. F. Keddie. 1968. Birds killed by oil in the Tay Estuary, March and April 1968. Scottish Birds 5: 189-196. [III-Bird]

Gress, F. 1970. Reproductive status of the California Brown Pelican in 1970 with notes on breeding biology and natural history. Calif. Dep. Fish Game, Wildl. Manage. Bur. Admin. Rep. 70-6: 1-21 (mimeographed). [III-Bird]

Gress, F.; R. W. Risebrough, D. W. Anderson; L. F. Kiff and J. R. Jehl, Jr. 1973. Reproductive failures of Double-crested Cormorants in southern California and Baja California. Wilson Bull. 85: 197-208. [II, III Bird]

Gress, F.; R. W. Risebrough and F. C. Sibley. 1971. Shell-thinning in eggs of the Common Murre, Uria aalge, from the Farallon Islands California. Condor 73: 368-369. [III-Bird]

Grigg, R. W. and T. Dana. 1969. Accidental encounter with a whale. Jour. of Mammal. 50(4): 818-819. [III-Ceta]

Grinnell, Jr. 1897. Report on the birds recorded during a visit to the islands of Santa Barbara, San Nicolas and San Clemente, in the spring of 1897. Pasadena Acad. Sci. 1: 1-25. [II, III-Bird]

Grinnell, J. 1898. Birds of the Pacific slope of Los Angeles County. Pasadena Acad. Sci., Ser. 2: 6ff. [III-Bird]

Grinnell, J. 1899. The Rhinoceros Auklet at Catalina Island. Bull. Cooper Ornith. Club 1:17 [III-Bird]

Grinnell, J. and A. H. Miller. 1944. The distribution of the birds of California. Pacific Coast Avifauna 27:1-608. [II, III-Bird]

Guiget,

Gustafson, C. E. 1968. Prehistoric use of fur seals: evidence from the Olympic coast of Washington. Science 161: 49-51. [III-Pinn]

Hald-Mortensen, P. 1971. Olie Fugle. Feltornithologen 4: 186-190. [III-Bird]

Hall, E. R. and K. R. Kelson. 1959. The Mammals of North America. Ronald Press, New York II: 806-840. [III-Ceta]

Hallberg, D. H., E. J. Janza and G. P. Trapp. 1974. A vehicle-mounted directional antenna system for biotelemetry monitoring. Calif. Fish and Game 60: 172-177. [II, III-Bird]

Hancock, D. 1970. California sea lion as a regular winter visitant off the British Columbia coast. J. Mammal. 51(3): 614. [III-Pinn]

Hanna, G. D. and A. W. Anthony. 1923. A cruise among desert islands. Nat. Geogr. Mag. 44(1): 71-99. [III-Pinn]

Harper, C. A. 1971. Breeding biology of a small colony of Western Gulls (Larus occidentalis wymani) in California. Condor 73: 337-341. [II, III-Bird]

Harrington, B. A. 1975. Pelagic gulls in winter off southern California. Condor 77: 346-350. [II, III-Bird]

Hartung, R. 1965. Some effects of oiling on reproduction of ducks. J. Wildl. Manage. 29: 872-874. [III-Bird]

Heath, H. 1915. Birds observed on Forrester Island, Alaska, during the summer of 1913. Condor 17: 20-41. [III-Bird]

Heller, E. 1904. Mammals of the Galapagos Archipelago, exclusive of the Cetacea. Calif. Acad. Sci. Pro. 3(3): 233-250. [III-Pinn]

Higgins, E. 1919. Porpoise captures. California Fish and Game 5(3): 157. [III-Ceta]

Hoffman, W.; W. P. Elliott and J. M. Scott. 1975. The occurrence and status of the Horned Puffin in the western United States. Western Birds 6: 87-94. [III-Bird]

Hoffman, R. 1932. Bird notes from Santa Cruz Island. Condor 34:190. [III-Bird]

Holder, C. H. 1899. A great pelican rookery. Museum 5: 71-72. [III-Bird]

Hope-Jones, P. G. Howells, E. I. S. Rees and J. Wilson. 1970. Effects of Hamilton Trader oil on birds in the Irish Sea in May 1969. British Birds 63: 97-110. [III-Bird]

Howell, A. B. 1917. Birds of the islands off the coast of southern California. Pacific Coast Avifauna 12:1-127. [II, III-Bird]

Howell, A. B. and A. J. van Rossen. 1911. Further notes from Santa Cruz Island. Condor 13:208-210. [III-Bird]

Hubbs, C. L. 1946. First records of two beaked whales, Mesoplodon bowdoini and Ziphius cavirostris from the Pacific coast of the United States. Jour. of Mammal. 27(2): 242-255. [III-Ceta]

Hubbs, C. L. 1953. Dolphin protecting dead young. Jour. of Mammal. 34(4): 498. [III-Ceta]

Hubbs, C. L. 1956. Back from oblivion. Guadalupe fur seal: still a living species. Pacific Discovery 9:14-21 [III-Pinn]

Hubbs, C. L. Sept-Oct. 1975. Pers. comm. Scripps Institution of Oceanography, La Jolla, California [III-Ceta]

Hubbs, C. L., A. L. Kelly and C. Limbaugh. 1970. Diversity in feeding by Brandt's Cormorant near San Diego, California. Calif. Fish and Game 56: 156-165. [III-Bird]

Huber, L. N. 1968. Preliminary report of San Miguel Island and adjacent islets, Prince and Castle. Unpubl. ms. on file at U. S. Natl. Mus. Nat. Hist., Washington, D. C. [III-Bird]

Huey, L. M. 1930. Capture of an elephant seal off San Diego, Calif. with notes on stomach contents. J. Mammal. 11: 229-231. [III-Pinn]

Hunt, B. L., Jr. 1972. Influence of food distribution and human disturbance on the reproductive success of Herring Gulls. Ecology 53: 1051-1061. [III-Bird]

Hunt, G. L., Jr. and M. W. Hunt. 1973. Clutch size, hatching success, and eggshell-thinning in Western Gulls. Condor 75: 483-486. [III-Bird]

Hunt, G. L. and M. W. Hunt. 1974. Trophic levels and turnover rates: the avifauna of Santa Barbara Island, California. Condor 76:363-369. [III-Bird]

Hunt, G. L., Jr. and M. W. Hunt. 1975. Reproductive ecology of the Western Gull: the importance of nest spacing. Auk 92: 270-279. [III-Bird]

Hunt, G. L., Jr. and M. W. Hunt. 1976a. Gull chick survival: the significance of growth rates, timing of breeding and territory size. Ecology 57: 62-75. [III-Bird]

Hunt, G. L., Jr. and M. W. Hunt. 1976b. Exploitation of fluctuating food resources by Western Gulls. Auk 93: 301-307. [III-Bird]

Hunt, G. L., Jr. M. W. Hunt and R. W. Risebrough. Evidence for female-female pairing and extra-pair courtship among Western Gulls. Unpubl. ms.[II-Bird].

Hunt, G. L., Jr. and S. C. McLoon. 1975. Activity patterns of gull chicks in relation to feeding by parents: their potential significance for density-dependent mortality. Auk 92:523-527. [III-Bird]

Ingolfsson, A. 1967. The feeding ecology of five species of large gulls (Larus) in Iceland. Ph. D. Dissertation, University of Michigan, Ann Arbor. 186 pp. [III-Bird]

Jehl, J. R., Jr. 1973a. Studies of a declining population of Brown Pelicans in northwestern Baja California. Condor 75: 69-79. [III-Bird]

Jehl, J. R., Jr. 1973b. Late autumn observations of pelagic birds off southern California. Western Birds 4:45-52. [II, III-Bird]

Jehl, J. R., Jr. 1974. Survey of marine birds and mammals in the vicinity of Santa Catalina, San Clemente and Santa Barbara Islands, 9-12 July 1974. In Environmental assessment study: proposed sale of federal oil and gas leases, Southern Calif. Outer Cont. Shelf. App. 9, Western Oil and Gas Asso., Los Angeles, 11 pp [II, III-Bird]

Jehl, J. R., Jr. 1975. A Craveri's Murrelet from Oregon. Western Birds 6:109. [III-Bird]

Jehl, J. R., Jr. and S. I. Bond. 1975. Morphological variation and species limits in murrelets of the genus Endomychura. San Diego Soc. Nat. Hist., Trans. 18: 9-23. [III-Bird]

Joensen, A. H. 1972. Studies on oil pollution and seabirds in Denmark 1968-1971. Danish Rev. Gam Biol. 6: 3-32. [II, III-Bird]

Johnsgard, P. A. 1975. Waterfowl of North America. Indiana Univ. Press, Bloomington. [III-Bird]

Johnson, A. M. 1968. Annual mortality of territorial male fur seals and its management significance. J. Wildl. Management 32(1): 94-99. [III-Pinn]

Johnson, A. M. 1975. The status of northern fur seal populations. Rapp. P.-v. Re'un. Cons. int. Explor. Mer 169:263-266. [III-Pinn]

Johnson, G. B. 1974. Enzyme polymorphism and metabolism. Science 184: 28-37. [III-Pinn]

Jones, H. L. Birds of the Channel Islands. In prep. [III-Bird]

Jones, J. H. 1971. General circulation and water characteristics in the Southern California Bight. Southern California Coastal Water Res. Proj. Tech. Rep. 101. 37 pp. [III-Bird]

Jordan, D. S., et al. 1899. The fur seals and fur seal islands of the North Pacific Ocean (Rep. of fur seal invest., 1896-1897). Part 3. Government Printing Office, Washington, D. C. 629 pp. [III-Pinn]

Kadlec, J. A. 1976. Re-evaluation of mortality rates in adult Herring Gulls. Bird Banding 47: 8-12. [III-Bird]

Kadlec, J. A. and W. H. Drury. 1968. Structure of the New England Herring Gull population. Ecology 49: 644-676. [III-Bird]

Kebbe, C. E. 1958. Nesting records of the Red-necked Grebe in Oregon. Murrelet 39: 14. [III-Bird]

Keith, J. O., L. A. Woods, Jr. and E. G. Hunt. 1971. Reproductive failure in Brown Pelicans on the Pacific coast. Trans. N. Amer. Wildl. and Nat. Res. Conf. 35: 56-63. [III-Bird]

Kenyon, K. W. 1952. A bottlenose dolphin from the California coast. Jour. of Mammal. 33(3): 385-387. [III-Ceta]

Kenyon, K. W. 1960. Territorial behavior and homing in the Alaska fur seal. Mammalia 24: 431-444. [III-Pinn]

Kenyon, K. W. 1965. Food of the harbor seals at Amchitka Island, Alaska. Jour. of Mammal. 46: 103-104. [III-Pinn]

Kenyon, K. W. and D. W. Rice. 1958. Homing of Laysan Albatrosses. Condor 60: 36. [III-Bird]

Kenyon, K. W. and D. W. Rice. 1961. Abundance and distribution of the Steller sea lion. Jour. of Mammal. 42: 223-234. [III-Pinn]

Kenyon, K. W., V. B. Scheffer and D. G. Chapman. 1954. A population study of the Alaska fur seal herd. Spec. Sci. Rep. Wildl., U. S. Fish Wildl. Serv. 12, 77 pp. [III-Pinn]

Kenyon, K. W. and F. Wilke. 1953. Migration of the northern fur seal, Callorhinus ursinus. Jour. of Mammal. 34(1): 86-98. [III-Pinn]

Keyes, M. C. 1968. The nutrition of pinnipeds. In R. J. Harrison, et al. (eds.) The behavior and physiology of pinnipeds. Appleton-Century-Crofts, N. Y. pp. 359-395. [III-Pinn]

King, J. E. 1954. The otariid seals of the Pacific coast of America. Bull. Br. Mus. Nat. Hist., Zoology 2(10): 311-337. [III-Pinn]

King, W. B. 1970. The trade wind zone oceanography pilot study, part VII: Seabird observations March 1964 to June 1965. U. S. Fish Wildl. Serv. Spec. Sci. Rep. - Fish. 586. 136 pp. [III-Bird]

King, W. B. (ed.) 1974. Pelagic studies of seabirds in the central and eastern Pacific Ocean. Smithson. Contrib. Zool. 158. 277 pp. [II, III-Bird]

Klinkhart, E. G. 1967. Birth of a harbor seal pup. Jour. of Mammal. 48: 677. [III-Pinn]

Lance, C. C. and R. S. Peterson. 1968. Seasonal fluctuations in populations of California sea lions. Univ. Calif., Santa Cruz, Ano Nuevo Reports 2: 30-36. [III-Pinn]

Lander, R. H. and H. Kajimura. 1976. Status of northern fur seals. Rep. to the Advisory Committee on Mar. Resources Res., Food and Agriculture Org. of the U. N. 50 pp. [III-Pinn]

Leatherwood, J. S., W. E. Evans and D. W. Rice. 1972. The whales, dolphins and porpoises of the eastern North Pacific. Naval Undersea Center. [III-Ceta]

Le Boeuf, B. J. 1970. Report of an expedition to Baja California Islands, 20 January to 5 February 1970. Univ. of Calif., Santa Cruz. 7 pp. [III-Pinn]

Le Boeuf, B. J. 1971a. Oil contamination and elephant seal mortality: a "negative" finding. In Biological and oceanographical survey of the Santa Barbara Channel oil spill, 1969-1970. D. Straughan (ed.), vol. 1, Allan Hancock Found., Univ. of Southern Calif. pp. 287-295. [III-Pinn]

Le Boeuf, B. J. 1971b. The aggression of the breeding bulls. Nat. Hist. 80: 82-94. [III-Pinn]

Le Boeuf, B. J. 1972. Sexual behavior in the northern elephant seal, Mirounga angustirostris. Behaviour 41: 1-26. [III-Pinn]

Le Boeuf, B. J. 1974a. Male-male competition and reproductive success in elephant seals. Amer. Zool. 14: 163-176. [III-Pinn]

Le Boeuf, B. J. 1974b. Report of a visit to Los Coronado, Mexico, 31 January 1974. Unpubl. expedition report, Univ. Calif., Santa Cruz. 7 pp. [III-Pinn]

Le Boeuf, B. J. 1976. The northern elephant seal: Back from extinction? Amer. Assoc. of Zool. Parks and Aquaria, Reg. Conf. Proc., 1975-1976. In press. [III-Pinn]

Le Boeuf, B. J., D. G. Ainley and T. J. Lewis. 1974. Elephant seals on the Farallons: Population structure of an incipient breeding colony. Jour. of Mammal. 55: 370-385. [III-Pinn]

Le Boeuf, B. J. and M. L. Bonnell. 1971. DDT in California sea lion. Nature 234: 108-110. [III-Pinn]

Le Boeuf, B. J. and K. T. Briggs. 1976. The cost of living in a seal harem. Mammalia. In press. [III-Pinn]

Le Boeuf, B. J., D. A. Countryman and C. L. Hubbs. 1975. Records of elephant seals, Mirounga angustirostris, on Los Coronados Islands, Baja California, Mexico, with recent analyses of the breeding population. Trans. of San Diego Soc. of Nat. Hist. 18: 1-7. [III-Pinn]

Le Boeuf, B. J. and K. J. Panken. 1976. Elephant seals breeding on the mainland in California. Jour. of Mammal. In press. [III-Pinn]

Le Boeuf, B. J. and R. S. Peterson. 1969. Social status and mating activity in elephant seals. Science 163: 91-93. [III-Pinn]

Le Boeuf, B. J. and L. Petrinovich. 1973. Report of an expedition to Isla de Guadalupe, 30 January to 15 February. Univ. Calif. Santa Cruz. 10 pp. [III-Pinn]

Le Boeuf, B. J. and M. Sylvan. 1976. A statistical model for estimating the number of breeding females in a colony of northern elephant seals. Trans. San Diego Soc. Nat. Hist. In press. [III-Pinn]

Le Boeuf, B. J., R. J. Whiting and R. F. Gantt. 1972. Perinatal behavior of northern elephant seal females and their young. Behaviour 43: 121-156. [III-Pinn]

Lentfer, J. W. 1973. Occurrence of a northern fur seal near Wainwright, Alaska. Can. Field-Nat. 87: 60. [III-Pinn]

Linton, C. B. 1908. Notes from Santa Cruz Island. Condor 10: 124-129. [III-Bird]

Loomis, L. M. 1900. California water birds. Proc. Calif. Acad. Sci.,Ser. 3 Zool. 2: 277-322 and 349-363. [III-Bird]

Loomis, L. M. 1918. A review of the albatrosses, petrels and diving petrels. Proc. Calif. Acad. Sci., Ser. 4 Zool. 2: 132. [III-Bird]

Lustig, B. L. 1948. Sight records of Dall porpoises off the Channel Islands, California. Jour. of Mammal. 29(2): 183. [III-Ceta]

Lyon, J. M. 1937. Pinnipeds and a sea otter from the Point Mugu shell mound off California. Univ. of Calif. Publ. in Biol. Sci. 1: 133-168. [III-Pinn]

Maher, W. J. 1974. Ecology of Pomarine, Parasitic and Long-tailed Jaegers in northern Alaska. Pac. Coast Avifauna 37: 1-148. [III-Bird]

Manuwal, D. A. 1974a. The natural history of Cassin's Auklet (Ptychoramphus aleuticus). Condor 76: 421-431. [III-Bird]

Manuwal, D. A. 1974b. Effects of territoriality on breeding in a population of Cassin's Auklet. Ecology 55: 1399-1406. [III-Bird]

Margolis, L. and M. D. Dailey. 1972. Revised annotated list of parasites from sea mammals caught off the west coast of North America. NOAA Tech. Report NMFS SSRF-647. Seattle, Washington. 23 pp. [III-Para]

Marine Mammal Names. 1976. By the U. S. Marine Mammal Commission. [III-Ceta]

Marine Mammal Protection Oversight. 1974. Report to the House Committee on Merchant Marine and Fisheries. [III-Ceta]

Marshall, A. J. and D. L. Serventy. 1956. The breeding cycle of the Short-tailed Shearwater, Puffinus tenuirostris (Temminck), in relation to trans-equatorial migration and its environment. Proc. Zool. Soc. Lond. 127: 489-510. [III-Bird]

Mate, B. R. 1975. Annual migrations of the sea lions Eumetopias jubata and Zalophus californianus along the Oregon coast. Rapp. P.-v. Re'un. Cons. Int. Explor. Mer 169: 455-461.[III-Pinn]

Mate, B. R. 1976. History and present status of the California sea lion, Zalophus californianus. Report to the Advisory Committee on Mar. Resources Res., Food and Agriculture Org. of the U. N. 6 pp. [III-Pinn]

Mathisen, O. A., R. T. Baade and R. J. Lopp. 1962. Breeding habits, growth and stomach contents of the Steller sea lion in Alaska. Jour. of Mammal. 43(4): 469-477. [III-Pinn]

McCaskie, R. G. 1963. The spring migration: southern Pacific coast region. Audubon Field Notes 17(4): 432-436. [III-Bird]

McCaskie, R. G. 1964a. The fall migration: southern Pacific coast region. Audubon Field Notes 18(1): 71-76. [III-Bird]

McCaskie, R. G. 1964b. The winter season: southern Pacific coast region. Audubon Field Notes 18(3): 385-390. [III-Bird]

McCaskie, R. G. 1964c. The spring migration: southern Pacific coast region. Audubon Field Notes 18(4): 485-488. [III-Bird]

McCaskie, R. G. 1964d. The nesting season: southern Pacific coast region. Audubon Field Notes 18(5): 534-536. [III-Bird]

McCaskie, R. G. 1965a. The fall migration: southern Pacific coast region. Audubon Field Notes 19(1): 76-82. [III-Bird]

McCaskie, R. G. 1965b. The winter season: southern Pacific coast region. Audubon Field Notes 19(3): 415-418. [III-Bird]

McCaskie, R. G. 1965c. The spring migration: southern Pacific coast region. Audubon Field Notes 19(4): 510-512. [III-Bird]

McCaskie, R. G. 1965d. The nesting season: southern Pacific coast region. Audubon Field Notes 19(5): 576-578. [III-Bird]

McCaskie, R. G. 1966a. The fall migration: southern Pacific coast region. Audubon Field Notes 20(1): 90-93. [III-Bird]

McCaskie, R. G. 1966b. The winter season: southern Pacific coast region. Audubon Field Notes 20(3): 458-461. [III-Bird]

McCaskie, R. G. 1966c. The spring migration: southern Pacific coast region. Audubon Field Notes 20(4): 545-547. [III-Bird]

McCaskie, R. G. 1966d. The nesting season: southern Pacific coast region. Audubon Field Notes 20(5): 598-600. [III-Bird]

McCaskie, R. G. 1967a. The fall migration: southern Pacific coast region. Audubon Field Notes 21(1): 76-80. [III-Bird]

McCaskie, R. G. 1967b. The winter season: southern Pacific coast region. Audubon Field Notes 21(3): 456-460. [III-Bird]

McCaskie, R. G. 1967c. The spring migration: southern Pacific coast region. Audubon Field Notes 21(4): 539-542. [III-Bird]

McCaskie, R. G. 1967d. The nesting season: southern Pacific coast region. Audubon Field Notes 21(5): 603-605. [III-Bird]

McCaskie, R. G. 1968a. The fall migration: southern Pacific coast region. Audubon Field Notes 22(1): 88-92. [III-Bird]

McCaskie, R. G. 1968b. The winter season: southern Pacific coast region. Audubon Field Notes 22(3): 476-480. [III-Bird]

McCaskie, R. G. 1968c. The spring migration: southern Pacific coast region. Audubon Field Notes 22(4): 574-578. [III-Bird]

McCaskie, R. G. 1968d. The nesting season: southern Pacific coast region. Audubon Field Notes 22(5): 646-650. [III-Bird]

McCaskie, R. G. 1969a. The fall migration: southern Pacific coast region. Audubon Field Notes 23(1): 106-112. [III-Bird]

McCaskie, R. G. 1969b. The winter season: southern Pacific coast region. Audubon Field Notes 23(3): 519-523. [III-Bird]

McCaskie, R. G. 1969c. The spring migration: southern Pacific coast region. Audubon Field Notes 23(4): 624-628. [III-Bird]

McCaskie, R. G. 1969d. The nesting season: southern Pacific coast region. Audubon Field Notes 23(5): 693-696. [III-Bird]

McCaskie, R. G. 1970a. The fall migration: southern Pacific coast region. Audubon Field Notes 24(1): 96-100d. [III-Bird]

McCaskie, R. G. 1970b. The winter season: southern Pacific coast region. Audubon Field Notes 24(3): 537-541. [III-Bird]

McCaskie, R. G. 1970c. The spring migration: southern Pacific coast region. Audubon Field Notes 24(4): 642-646. [III-Bird]

McCaskie, R. G. 1970d. The nesting season: southern Pacific coast region. Audubon Field Notes 24(5): 715-718. [III-Bird]

McCaskie, R. G. 1970e. The occurrences of four species of Pelecaniformes in the southwestern United States. Calif. Birds 1: 117-142. [III-Bird]

McCaskie, R. G. 1971a. The fall migration: southern Pacific coast region. Amer. Birds 25(1): 106-112. [III-Bird]

McCaskie, R. G. 1971b. The winter season: southern Pacific coast region. Amer. Birds 25(3): 626-631. [III-Bird]

McCaskie, R. G. 1971c. The spring migration: southern Pacific coast region. Amer. Birds 25(4): 799-804. [III-Bird]

McCaskie, R. G. 1971d. The nesting season: southern Pacific coast region. Amer. Birds 25(5): 905-908. [III-Bird]

McCaskie, R. G. 1972a. The fall migration: southern Pacific coast region. Amer. Birds 26(1): 118-124. [III-Bird]

McCaskie, R. G. 1972b. The winter season: southern Pacific coast region. Amer. Birds 26(3): 654-657. [III-Bird]

Merriam, C. H. 1897. A new fur seal or sea-bear (Arctocephalus townsendi) from Guadalupe Island, off Lower California. Proc. Biol. Soc. Wash. 11: 175-178. [III-Pinn]

Michael, C. W. 1935. Nesting habits of cormorants. Condor 37: 36-37. [III-Bird]

Miller, D. E. and J. T. Emlen, Jr. 1975. Individual chick recognition and family integrity in the Ring-billed Gull. Behaviour 52: 124-144. [III-Bird]

Miller, G. S., Jr. and R. Kellogg. 1955. List of North American recent mammals. Bull. U. S. Nat. Mus., No. 205. 954 pp. [III-Ceta]

Miller, L. 1936. Some maritime birds observed off San Diego, California. Condor 38: 9-16. [III-Bird]

Miller, L. 1940. Observations of the Black-footed Albatross. Condor 42: 229-238. [III-Bird]

Milon, P. and Bougerol, C. E. F. 1967. Séjour à Rouzic, du 20 au 24 Avril (Visit to Rouzic, from April 20-24). L'homme et l'oiseau 9: 12-13. [III-Bird]

Mitchell, E. 1965. Evidence for mass stranding of the false killer whale (Pseudorca crassidens) in the Eastern North Pacific Ocean. Norsk Hvalfangst-Tidende 8: 172-177. [III-Ceta]

Moffit, J. and R. T. Orr. 1938. Recent disastrous effects of oil pollution on birds in the San Francisco Bay region. Calif. Fish and Game 24: 239-244. [III-Bird]

Monnat, J. Y. 1967. Effets du mazout sur les oiseaux marins. In R. Vermeer and K. Vermeer 1974. Oil pollution of birds: an abstracted bibliography. Pesticide section, Can. Wildl. Serv. Rep. Ser 24. [II, III-Bird]

Moore, J. C. and R. M. Gilmore. 1965. A beaked whale new to the western hemisphere. Nature 205(4977): 1239-1240. [III-Ceta]

Morejohn, G. V. and D. M. Baltz. 1970. Contents of the stomach of an elephant seal. Jour. of Mammal. 51: 173-174. [III-Pinn]

Morejohn, G. V. and D. W. Rice. 1973. First record of Bryde's whale (Balaenoptera edeni) off California. Calif. Fish and Game 59(4): 313-315. [III-Ceta]

Moyle, P. 1966. Feeding behavior of the Glaucous-winged Gull on an Alaskan salmon stream. Wilson Bull. 78: 175-190. [III-Bird]

Murie, O. J. 1959. Fauna of the Aleutian Islands and Alaska Peninsula. North Amer. Fauna 61, Washington, D. C. [III-Bird]

Naito, Y. 1976. Harbour seal in the North Pacific and some other biological aspects. Rep. to the Advisory Committee on Mar. Resources Res., Food and Agriculture Org. of the U. N. 13 pp. [III-Pinn]

Naito, Y. and M. Nishiwaki. 1975. Ecology and morphology of Phoca vitulina largha and Phoca kurilensis in the Southern Sea of Okhotsk and northeast of Hokkaido. Rapp. P.-v. Re'un. Cons. Int. Explor. Mer 169: 379-386. [III-Pinn]

Neiland, K. A., D. W. Rice and B. L. Holden. 1970. Helminths of marine mammals. I. The genus Nasitrema air sinus flukes of delphinid Cetacea. J. Parasit. 56: 305-316. [III-Para]

Nelson-Smith, A. 1973. Oil pollution and marine ecology. Plenum Press, N. Y. [III-Bird]

Newby, T. C. 1973a. Observations on the breeding behavior of the harbor seal inthe state of Washington. Jour. of Mammal. 54(2): 540-543. [III-Pinn]

Newby, T. C. 1973b. Changes in the Washington State harbor seal population 1942-1972. Murrelet 54: 4-6. [III-Pinn]

Nishiwaki, M. 1965.

Nishiwaki, M. 1972. General biology. In Mammals of the Sea. S. Ridgway, ed., 6-135. [III-Ceta]

Nogueron, V. V. 1969. Aves aquiticas migratorias en Isla Raza, B. C. Dep. Conserv. y Propag. Fauna Silvestre. Dir. Gen. Fauna Silvestre: 1-42. [III-Bird]

Norris, K. S. and J. H. Prescott. 1961. Observations on Pacific cetaceans of California and Mexican waters. Univ. Calif. Publ. in Zool. 63(4): 291-402. [III-Ceta]

North Pacific Fur Seal Commission. 1969. Report on investigations from 1964 to 1966. Hdqtrs. NPFSC, Washington, D. C. 161 pp. [III-Pinn]

O'Connor, R. J. 1967. The Torrey Canyon. A census of breeding auks in Cornwall, June 1967. In R. Vermeer and K. Vermeer 1974. Oil pollution in seabirds: an abstracted bibliography. Pesticide Section, Can. Wildl. Serv. Rep. Ser. 29. [II, III-Bird]

Odell, D. K. 1970. Premature pupping in the California sea lion. In Proc. 7th Ann. Biosonar and Diving Mammal Conf. (Stanford Research Inst., Menlo Park, Calif.) pp. 185-190. [III-Pinn]

Odell, D. K. 1971. Censuses of pinnipeds breeding on the California Channel Islands. Jour. of Mammal. 52(1): 187-190. [III-Pinn]

Odell, D. K. 1972. Studies on the biology of the California sea lion and the northern elephant seal on San Nicolas Island, California. Uinv. Calif., Los Angeles Ph.D. thesis. 168 pp. [III-Pinn]

Orr, R. T. 1967. The Galapagos sea lion. Jour. of Mammal. 48: 62-69. [III-Pinn]

Orr, R. T. and T. C. Poulter. 1965. The pinniped population of Ano Nuevo Island, California. Proc. Calif. Acad. Sci., Ser. 4 32(13): 377-404. [III-Pinn]

Orr, R. T. and T. C. Poulter. 1967. Some observations on reproduction, growth, and social behavior in the Steller sea lion. Proc. Calif. Acad. Sci., Ser. 4 35(10): 193-226. [III-Pinn]

Orr, R. T., J. Schonewald and K. W. Kenyon. 1970. The California sea lion: skull growth and a comparison of two populations. Calif. Acad. Sci., Proc., Ser. 4 37: 381-394. [III-Pinn]

Palmer, R. S. (ed.) 1962. Handbook of North American birds. 1. Loons through flamingoes. Yale Univ. Press. New York. 567 pp. [III-Bird]

Patten, S. M., Jr. 1975. Sympatry and interbreeding of Herring and Glaucous-winged Gulls in southern Alaska. Annual meeting, Pacific Seabird Group (abstr.) [III-Bird]

Paulbitski, P. A. 1974. Pinnipeds observed in the rivers of northern California. Calif. Fish and Game 60: 48-49. [III-Pinn]

Payne, R B 1965. The molt of breeding Cassin's Auklets. Condor 67 220-228. [III-Bird]

Pearson, A. K. and R. K. Enders. 1951. Further observations on the reproduction of the Alaskan fur seal. The Anat. Record 111 (4): 695-711 [III-Pinn]

Pearson, J. P and B. J. Verts. 1970. Abundance and distribution of harbor seal and northernsea lions in Oregon. Murrelet 51: 1-5. [III-Pinn]

Pemberton, J. R. 1928. Additions to the known avifauna of the Santa Barbara Islands. Condor 30: 144-148. [II, III-Bird]

Pemberton, J. R. 1929. Some new records for Santa Barbara Island. Condor 31: 37. [III-Bird]

Perrin, W. Feb. 1976. Pers. comm. National Marine Fisheries, La Jolla, California. [III-Ceta]

Peterson, R. S. 1965. Behavior of the northern fur seal. Johns Hopkins Univ., Baltimore, Dr. Sci. thesis. 214 pp. [III-Pinn]

Peterson, R. S. 1968. Social behavior in pinnipeds, with particular reference to the northern fur seal. In R. J. Harrison et al. (eds.) The behavior and physiology of pinnipeds. Appleton-Century-Crofts, New York. pp. 3-53. [III-Pinn]

Peterson, R. S. and G. A. Bartholomew. 1967. The natural history and behavior of the California sea lion. Amer. Soc. Mammalogists, Spec. Publ. 1. 79 pp. [III-Pinn]

Peterson, R. S., R. L. Gentry and B. J. Le Boeuf. 1968. Investigations of pinnipeds on San Miguel and San Nicolas Islands. Unpubl. expedition report, Univ. Calif., Santa Cruz. 15 pp. [III-Pinn]

Peterson, R. S., C. L. Hubbs, R. L. Gentry and R. L. DeLong. 1968. The Guadalupe fur seal: habitat, behavior, population size, and field identification. Jour. of Mammal. 49(4): 665-675. [III-Pinn]

Peterson, R. S. and B. J. Le Boeuf. 1968. Report of a second visit to the San Miguel fur seal colony, 23-24 August, 1968. Unpubl. trip report, Univ. Calif., Santa Cruz. 7 pp. [III-Pinn]

Peterson, R. S., B. J. Le Boeuf and R. L. DeLong. 1968. Fur seals from the Bering Sea breeding in California. Nature (London) 219: 899-901. [III-Pinn]

Peterson, R. S. and B. J. Le Boeuf. 1969. Report of an expedition to San Miguel Island 25-28 March 1969. Univ. Calif., Santa Cruz. 9 pp. [III-Pinn]

Peterson, R. S. and D. H. Ramsey. 1970. Reproductive behavior of the Guadalupe fur seal. Proc. 6th Ann. Conf. Biosonar, Stanford Research Inst. pp. 35-42. [III-Pinn]

Peterson, R. S. and W. G. Reeder. 1966. Multiple births in the northern fur seal. Zeit. f. Sangetienkunde 31: 52-56. [III-Pinn]

Peterson, R. T. 1961. A field guide to western birds. 2nd ed. Houghton Mifflin Co., Boston. [III-Bird]

Peterson, R. T. 1973. A field guide to Mexican birds. Houghton Mifflin Co., Boston. [III-Bird]

Peyton, S. B. 1913. A collecting trip to Anacapa Island. Oologist 30: 78. [III-Bird]

Phillips, J. H. 1963. The pelagic distribution of the Sooty Shearwater, Procellaria grisea (sic). Ibis 105: 340-353. [III-Bird]

Phillips, N. R. 1967. After the Torrey Canyon: results of the pollution and census of Cornish breeding seabirds in 1967. In R. Vermeer and K. Vermeer 1974. Oil pollution of birds: an abstracted bibliography. Pesticide Section, Can. Wildl. Serv. Rep. Ser. 29. [II, III-Bird]

Pierotti, R. 1976. Sex roles of the Western Gull in different habitats. M.S. dissertation, Calif. State Univ., Sacramento. [III-Bird]

Pierson, M. O. 1975. A report of pinniped investigations conducted on Isla de Guadalupe, June 11 to July 12, 1975. Unpubl. expedition report. Univ. Calif., Santa Cruz. 11 pp. [III-Pinn]

Poulter, T. C. and R. Jenning. 1966. Annual report to the Division of Beaches and Parks, State of California. Stanford Res. Inst. Menlo Park, Calif. 27 pp. [III-Pinn]

Pyle, R. L. and A. Small. 1961. Birds of southern California: annotated field list. Revised. Otis Wade, Los Angeles. [III-Bird]

Pyle, R. L. and R. L. DeLong. 1968. Avifauna of the Eastern Grid. Unpubl. ms. Smithsonian Inst. Pacific Ocean Biological Survey Program, 1963-1968. Washington, D. C. [II, III-Bird]

Quinlivan, K. R. 1974a. Some insights into the feeding habits of Heermann's Gulls along the coast of California. Sr. thesis, Univ. Calif., Santa Cruz. [III-Bird]

Quinlivan, K. R. 1974b. The results of the analysis of thirty-eight stomachs from Heermann's Gulls collected in Kino Bay on the Gulf of California. Unpubl. ms. [III-Bird]

Radford, K. W., R. T. Orr and C. L. Hubbs. 1965. Reestablishment of the northern elephant seal (_Mirounga angustirostris_) off central California. Proc. Calif. Acad. Sci. 31: 601-612. [III-Pinn]

Radovich, J. 1961. Relationships of some organisms of the Northeast Pacific to water temperatures, particularly during 1957 through 1959. Calif. Fish and Game Bull No. 112. 62 pp. [III-Pinn]

Reiter, J., N. L. Stinson and B. J. Le Boeuf. 1976. Ontogeny of elephant seal behavior: Weaning and the transition to an aquatic environment. Behaviour. In press. [III-Pinn]

Repenning, C. A., R. S. Peterson and C. L. Hubbs. 1971. Contributions to the systematics of the southern fur seals, with particular reference to the Juan Fernandes and Guadalupe species. _In_ W. H. Burt (ed.), Antarctic Pinnipedia, Antarct. Res. Ser., 18 AGU, Washington, D. C. pp. 1-34. [III-Pinn]

Rett, E. Z. 1947. A report on the birds of San Nicolas Island. Condor 49: 165-168.

Rice, D. W. 1963. Progress report on biological studies of the larger cetacea in the waters off California. Norsk Hvalfangst-Tidende 7: 181-187. [III-Ceta, Para]

Rice, D. W. 1963. The whale marking cruise of the _Sioux City_ off California and Baja California. Norsk Hvalfangst-Tidende 6: 153-160. [III-Ceta]

Rice, D. W. 1965. Offshore migration of gray whales off southern California. Jour. of Mammal. 46(3): 504-505. [III-Ceta]

Rice, D. W. 1968. Stomach contents and feeding behavior of killer whales in the eastern North Pacific. Norsk Hvalfangst-Tidende 57(2): 35-38. [III-Ceta, Pinn]

Rice, D. W. 1976. Large whales off the west coast of Mexico and in the Gulf of California. First International Meeting of Marine Mammal Biology at La Paz, Mexico. [III-Ceta]

Rice, D. W. and C. H. Fiscus. 1968. Right whales in the Southeastern North Pacific. Norsk Hvalfangst-Tidende 57(5): 105-107. [III-Ceta]

Rice, D. W. and K. W. Kenyon. 1962a. Breeding distribution, history and populations of North Pacific albatrosses. Auk 79: 365-386. [III-Bird]

Rice, D. W. and K. W. Kenyon. 1962b. Breeding cycles and behavior of Laysan and Black-footed Albatrosses. Auk 79: 517-567. [III-Bird]

Rice, D. W., K. W. Kenyon and D. L. Lluch. 1965. Pinniped populations at Islas Guadalupe, San Benito and Cedros, Baja California, in 1965. Trans. San Diego Soc. Nat. Hist. 14(7): 73-84. [III-Pinn]

Rice, D. W. and V. B. Scheffer. 1968. A list of the marine mammals of the world. U. S. Dept. of the Int., Fish and Wildl. Serv., Spec. Sci. Rep., Fisheries No. 579. 16 pp. [III-Ceta]

Rice, D. W. and A. A. Wolman. 1971. The life history and ecology of the gray whale, (Eschrichtius robustus). Spec. Publ. No. 3 of Amer. Soc. of Mammal. [III-Ceta]

Richardson, F. 1961. Breeding biology of the Rhinoceros Auklet on Protection Island, Washington. Condor 63: 456-473. [III-Bird]

Richardson, R. 1956. Seabirds affected by oil from the freighter Seagate. Murrelet 37: 20-22. [III-Bird]

Ridgway, S. H. 1966. Dall porpoise, Phocoenoides dalli (True): Observations in captivity and at sea. Norsk Hvalfangst-Tidende 5: 97-110. [III-Ceta]

Ridgway, S. H. and R. F. Green. 1967. Evidence for a sexual rhythm in male porpoises, L. obliquidens and D. bairdi. Norsk Hvalfangst-Tidende I: 1-8. [III-Ceta]

Ridgway, S. H., J. R. Geraci and W. Medway. 1975. Diseases of pinnipeds. Rapp. P.-v. Re'un. Cons. Int. Explor. Mer 169: 327-337. [III-Ceta]

Ripley, W. E., K. W. Cox and J. L. Baxter. 1962. The California sea lion census for 1958, 1960 and 1961. Calif. Fish and Game 48: 228-231. [III-Pinn]

Risebrough, R. W. 1972. Effects of environmental pollutants upon animals other than man. Proc. Berkeley Symp. Math., Statist., Prob. 6: 443-463. [III-Bird]

Risebrough, R. W., F. C. Sibley and M. N. Kirven. 1971. Reproductive failure of the Brown Pelican on Anacapa Island in 1969. Amer. Birds 25: 8-9. [III-Bird]

Rittinghaus, H. 1956. Etwas uber die "indirekte" Verbreitung der Olpest in einem See vogelschutz-gebeite. (On the "indirect" spread of oil pollution in a seabird sanctuary). Ornith. Mitteilungen 8: 43-46. [III-Bird]

Robertson, H. 1903. Cassin's Auklet, Ptychoramphus aleuticus. Condor 5: 96-97. [III-Bird]

Robertson, I. 1971. The influence of brood size on reproductive success in two species of cormorant, Phalacrocorax auritus and P. pelagicus, and its relation to the problem of clutch size. Ph.D. dissertation, Univ. of Brit. Columbia, Vancouver, Canada. [III-Bird]

van Rossem, A. J. 1939. Some new races of birds from Mexico. Ann. Mag. Nat. Hist. Ser. 11: 439-443. [III-Bird]

Rowley, J. 1929. Life history of the sea lions on the California coast. Jour. of Mammal. 10: 1-36. [III-Pinn]

Ryder, J. P. 1975. Egg-laying, egg size and success in relation to immature-mature plumage of Ring-billed Gulls. Wilson Bull. 87: 534-542. [III-Bird]

Sams, J. R. and K. Stott, Jr. 1959. Birds of San Diego County, California: an annotated checklist. Occas. Paper, San Diego Nat. Hist. Mus. 10: 1-49. [III-Bird]

Sandegren, F. 1970. Breeding and maternal behavior of the Steller sea lion (Eumetopias jubata) in Alaska. Univ. Alaska, M.Sc. thesis. 138 pp. [III-Pinn]

Sandegren, F. 1975. Sexual-agoinstic signalling and territoriality in the Steller sea lion. Rapp. P.-v. Re'un. Const. Int. Explor. mer 169: 195-204. [III-Pinn]

Sanger, G. A. 1972. Preliminary standing stock and biomass estimates of seabirds in the subarctic Pacific region. In A. Y. Takenouti (ed.), Biological oceanography of the northern North Pacific Ocean. Idemitsu Shoten, Tokyo. pp 589-611. [III-Bird]

Sanger, G. A. 1973. Pelagic records of Glaucous-winged and Herring Gulls in the North Pacific Ocean. Auk 90: 384-393. [III-Bird]

Sanger, G. A. 1974a. Black-footed Albatross (Diomedea nigripes). In W. B. King (ed.), Pelagic studies of seabirds in the central and eastern Pacific Ocean. Smithson. Contrib. Zool. 158: 96-128. [III-Bird]

Sanger, G. A. 1974b. Laysan Albatross (Diomedea immutabilis). In W. B. King (ed.), Pelagic studies of seabirds in the central and eastern Pacific Ocean. Smithson. Contrib. Zool. 158: 129-153. [III-Bird]

Scammon, C. M. 1874. The marine mammals of the northwestern coast of North America. J. H. Carmany and Co., San Francisco. 319 pp. (reproduced by Dover 1968). [III-Ceta, Pinn]

Scheffer, V. B. 1950. Growth of the testes and baculum in the fur seal, Callorhinus ursinus. Jour. of Mammal. 34(4): 384-394. [III-Pinn]

Scheffer, V. B. 1950. The striped dolphin, L. obliquidens Gill 1865, on the coast of North America. Amer. Midland Natur. 44: 751. [III-Ceta]

Scheffer, V. B. 1953. Measurements and stomach contents of eleven delphinids from the Northeast Pacific. Murrelet 34(2): 27-30. [III-Ceta]

Scheffer, V. B. 1958. Seals, sea lions and walruses. Stanford Univ. Press, Stanford, Calif. 179 pp. [III-Pinn]

Scheffer, V. B. and J. A. Neff. 1948. Food of California sea lions. Jour. of Mammal. 29: 67-68. [III-Pinn]

Scheffer, V. B. and J. W. Slipp. 1944. The harbor seal in Washington State. Amer. Midland Natur. 32:373-416. [III-Pinn]

Scheffer, V. B. and J. W. Slipp. 1948. The whales and dolphins of Washington State and a key to the cetaceans of the west coast of North America. Amer. Midland Natur. 39(2): 257-337. [III-Ceta]

Schmidt, G. D. and M. D. Dailey. 1971. A zoogeographic not on the Acanthocephalan Corynosoma bullosum (Linstow, 1892). Trans. Amer. Micros. Soc. 90: 94-95. [III-Para]

Schreiber, R. W. 1970. Breeding biology of Western Gulls (Larus occidentalis) on San Nicolas Island, California, 1968. Condor 72: 133-140. [III-Bird]

Schreiber, R. W. and R. L. DeLong. 1969. Brown Pelican status in California. Audubon Field Notes 23: 57-59. [II, III-Bird]

Schreiber, R. W. and R. W. Risebrough. 1972. Studies of the Brown Pelican. 1. Status of Brown Pelican populations in the United States. Wilson Bull. 84: 119-135. [III-Bird]

Scott, J. M. 1973. Resource allocation in four syntopic species of marine diving birds. Ph.D. dissertation, Oregon State Univ., Corvallis, Ore. 97 pp. [III-Bird]

Scott, J. M. 1974. Marine birds of southern California (Pt. Conception to Mexican border) and their relation to the oil industry. In Environmental assessment study: proposed sale of federal oil and gas leases, Southern California Outer Continental Shelf, appendix 8, Western Oil and Gas Association, Los Angeles. 92 pp. [III-Bird]

Scott, J. M., W. Hoffman, D. G. Ainley and F. Zeillemaker. 1974. Range expansion and activity patterns in Rhinoceros Auklets. Western Birds 5: 13-20. [III-Bird]

Sealy, S. G. 1973. Breeding biology of the Horned Puffin on St. Lawrence Island, Bering Sea, with zoogeographical notes on the North Pacific puffins. Pacific Sci. 27: 99-119. [III-Bird]

Sefton, J. W., Jr. 1927. An Ancient Murrelet at San Diego, with a note on the behavior of Brown Pelicans. Condor 29: 163-164. [III-Bird]

Sefton, J. W., Jr. 1934. Pelagic birds near shore. Condor 36: 242-243. [II, III-Bird]

Sen, A. R., J. Touriguy and G. E. J. Smith. 1974. On the line transect sampling method. Biometrics 30: 329-340. [III-Pinn]

Serventy, D. L. 1953. Movements of pelagic seabirds in the Indo-Pacific region. Proc. 7th Pacific Sci. Congr. 4: 394-407. [III-Bird]

Serventy, D. L. 1958. Recent studies on the Tasmanian Mutton Bird. Austr. Mus. Mag. 1958: 327-332. [III-Bird]

Shaughnessy, P. D. 1975. Biochemical comparison of the harbour seals Phoca vitulina richardi and P. v. largha. Rapp. P.-v. Re'un. Cons. Int. Explor. Mer 169: 70-73. [III-Pinn]

Simpson, J. G. and W. G. Gilmartin. 1970. An investigation of elephant seal and sea lion mortality on San Miguel Island. Bioscience 20: 289. [III-Pinn]

Sivertson, E. 1954. A survey of the eared seals (family Otariidae) with remarks on the Antarctic seals collected by M/K Norvegia in 1928-1929. Det Norske Videnskaps-Akademi i Oslo. Scientific results of the Norwegian Antarctic Expedition, 1927-1928 et seq. instituted and financed by Consul Lars Christensen 36: 1-76. [III-Pinn]

Smail, J., D. G. Ainley and H. Strong. 1972. Notes on birds killed in the 1971 San Francisco oil spill. Calif. Birds 3:25-32. [III-Bird]

Small, A. C. 1951-1963. Fall migration - winter season - spring migration - nesting season: southern Pacific coast region. Audubon Field Notes 5(1)-17(3). [II, III-Bird]

Small, A. C. 1954. The spring migration: southern Pacific coast region. Audubon Field Notes 8(4): 327-328. [III-Bird]

Small, A. C. 1955. The spring migration. Audubon Field Notes 9(4): 358-360. [III-Bird]

Small, A. C. 1960. The nesting season: southern Pacific coast region. Audubon Field Notes 14(5): 476-478. [III-Bird]

Small, A. C. 1974. The birds of California. Winchester Press, New York. 309 pp. [III-Bird]

Smith, A. W., T. G. Akers, S. H. Madin and N. A. Vedros. 1973. San Miguel sea lion virus isolation, preliminary characterization and relationship to vesicular exanthema of swine virus. Nature 244: 108-109. [III-Pinn]

Smith, A. W., R. J. Brown, D. E. Skilling and R. L. DeLong. 1974. Leptospira pomona and reproductive failure in California sea lions. Jour. Amer. Vet. Mde. Assoc. 165(11): 996-998. [III-Pinn]

Spalding, D. J. 1964. Comparative feeding habits of the fur seal, sea lion and harbour seal on the British Columbia coast. Fish. Res. Bd. Can. Bull. No. 146. 52 pp. [III-Pinn]

Squire, I. L. 1964. Bibliography of cetacea: Literature published between 1949 and 1963. China Lake, California: U. S. Naval Test Staion. (NOTS-TP-3686; NAVWEPS Rep. 8645). [III-Ceta]

Southern, W. E. 1974a. The annual range of Ring-billed Gulls in the eastern United States: with comments on potential bird/aircraft collision problems. In Aspects of the bird/aircraft collision problem. Proc. Conf. Biol. Clemson Univ. U. S. Air Force Off. Sci. Res. [III-Bird]

Southern, W. E. 1974b. Copulatory wing-flagging: a synchronizing stimulus for nesting Ring-billed Gulls, Bird-banding 45: 210-216. [III-Bird]

Southern, W. E. 1975. Migrational orientation in Ring-billed Gull chicks. Auk 93: 78-85. [III-Bird]

Spaans, A. L. 1971. On the feeding ecology of the Herring Gull, Larus argentatus Pont. in the northern part of the Netherlands. Ardea 59: 73-188. [II, III-Bird]

Speich, S. and D. A. Manuwal. 1974. Gular pouch development and population structure of Cassin's Auklet. Auk 91: 291-306. [III-Bird]

Starks, E. C. 1922. Records of the capture of fur seals on land in California. Calif. Fish and Game 8: 155-160. [III-Pinn]

Straughan, D. 1971. Oil pollution and seabirds. In D. Straughan (ed.), Biological and oceanographical survey of the Santa Barbara Channel oil spill. 1. Biology and bacteriology. Allan Hancock Foundation, Univ. of So. Calif., Los Angeles. pp. 307-312. [III-Bird]

Streator, C. P. 1888. Notes on the birds of the Santa Barbara Islands. Ornith. and Ool. 13: 52-54. [III-Bird]

Sumner, E. L., Jr. 1939. An investigation of Santa Barbara, Anacapa and San Miguel Islands. Unpubl. ms. [II, III-Bird]

Swickard, D. K. 1972. Status of the Least Tern at Camp Pendleton, California. Calif. Birds 3: 49-58. [III-Bird]

Tanis, J. J. C. and F. M. Morzer Bruijns. 1962. Het onderzoek naar stookolievogels van 1958-1962. (Investigations on seabirds killed by oil pollution, 1958-1962) Levende Nat. 65: 133-140. [III-Bird]

Taylor, F. H. C., M. Fujinaga and F. Wilke. 1955. Distribution and food habits of the fur seals of the North Pacific Ocean. Report of Coop. Invest. by Govts. of Can., Japan, and U. S. A., Feb.-July 1952. U. S. Govt. Printing Office, Washington, D. C. 86 pp. [III-Pinn]

Thorsteinsen, F. V. and C. J. Lensink. 1962. Biological observations of Steller sea lions taken during an experimental harvest. Jour. Wildl. Man. 26(4): 353-359. [III-Pinn]

Testa, J. E. and M. D. Daily. Morphology and zoogeography of Phyllobothrium delphini (Cestoda: Tetraphyllidea) in marine mammals. Bull. So. Calif. Acad. Sci. In press. [III-Para]

van Tets, G. F. 1965. A comparative study of some social communication patterns in the Pelecaniformes. Ornithol. Monogr. No. 2, Amer. Ornithol. Union. 88 pp. [III-Bird]

Thoresen, A. C. 1964. The breeding behavior of the Cassin's Auklet. Condor 66: 456-476. [III-Bird]

Thoresen, A. C. and E. S. Booth. 1958. Breeding activities of the Pigeon Guillemot, Cepphus columba columba (Pallas). Walla Walla Coll. Publ. Biol. Sci. 23. 36 pp. [III-Bird]

Tomilin, A. G. 1957. Mammals of the U.S.S.R. and adjacent countries. Nat. Tech Info. Service, 176-215. [III-Ceta]

Townsend, C. H. 1899. Notes on the fur seals of Guadalupe, the Galapagos and Lobos Islands. In D. S. Jordan et al. (eds.) The fur seals and fur seal isalnds of the North Pacific Ocean (Rep. of fur seal invest., 1896-1897). Part 3. Govt. Printing Office, Washington, D. C. pp. 265-274. [III-Pinn]

Townsend, C. H. 1912. The northern elephant seal. Zoologica 1: 159-173. [III-Pinn]

Townsend, W. C. 1968. Birds observed on San Nicolas Island, California. Condor 70: 266-268. [III-Bird]

Truitt, D. 1974. Dolphins and porpoises: A comprehensive annotated bibliography of the smaller cetacea. Detroit, Michigan: Gale Research Co. [III-Ceta]

Tuck, C. M. 1960. The murres, their distribution, populations and biology: a study of the genus Uria. Can. Wildl. Serv. Monogr. Ser. 1, Ottawa. [III-Bird]

Udvardy, M. D. F. 1963. Zoogeographical study of the Pacific Alcidae. In J. L. Gressit (ed.), Pacific basin biogeography, a symposium. Bishop Mus. Press, Honolulu. pp. 85-111. [III-Bird]

Unitt, P. 1975. Occurrence and migration of the Long-tailed Jaeger in North America. Ann. Mtg. Pac. Seabird Group (abstr.) [III-Bird]

U. S. Coast Guard, Airborne Radiation Thermometer Program. 1973-1976. Monthly charts of surface isotherms for southern California. [III-Bird]

Van Bree

Vedros, N. A., A. W. Smith, J. Schonewald, G. Migaki and R. C. Hubbard. 1971. Leptospirosis epizootic among California sea lions. Science 172: 1250-1251. [III-Pinn]

Venables, V. M. and L. S. V. Venables. 1955. Observations on a breeding colony of the seal Phoca vitulina in Shetland. Zool. Soc. Lond., Proc. 125: 521-532. [III-Pinn]

Venables, V. M. and L. S. V. Venables. 1959. Vernal coition of the seal Phoca vitulina in Shetland. Zool Soc. Lond., Proc. 132: 665-669. [III-Pinn]

Vermeer, K. 1963. The breeding ecology of the Glaucous-winged Gull (Larus glaucescens) on Mandarte Is., B. C. Occas. Paper B. C. Prov. Mus. 13. [III-Bird]

Vermeer, K. 1970. Breeding biology of California and Ring-billed Gulls. Can. Wildl. Serv. Rept. Ser. 12. [III-Bird]

Vermeer, K. and G. G. Anweiler. 1975. Oil threat to aquatic birds along the Yukon coast. Wilson Bull. 87: 467-480. [III-Bird]

Vermeer, R. and K. Vermeer. 1974. Oil pollution of birds: an abstracted bibliography. Pesticide Section, Can. Wildl. Serv. Rep. Ser. 29. 86 pp. [II, III-Bird]

Wagner, H. R. 1929. Spanish Voyages to the Northwest coast of America in the 16th century. San Francisco Calif. Hist. Soc. [III-Pinn]

Walker, W. A. 1975. Review of the live-capture fishery for smaller cetaceans taken in southern California waters for public display, 1966-1973. Jour. Fish. Res. Bd. of Can. vol. 32(7), July 1975. [III-Ceta]

Weghe, J. P. V. 1970. Identification of Common and Arctic Terns. Calif. Birds 1: 33-36. [III-Bird]

Wiens, J. A. and J. M. Scott. 1975. Model estimation of energy flow in Oregon coastal seabird populations. Condor 77: 439-452. [III-Bird]

Wilke, F. 1951. Preliminary Study No. 67, Gen. Hdqtrs. Supreme Comm. Allied Powers. cited in Bartholomew, G. A. and P. G. Hoel. 1953. Reproductive behavior of the Alaska fur seal, Callorhinus ursinus. Jour. of Mammal. 34(4): 417-436, p. 435. [III-Pinn]

Willet, G. 1910. A summer trip to the northern Santa Barbara Islands. Condor 12; 170-174. [II, III-Bird]

Willet, G. 1912. Birds of the Pacific slope of southern California. Pac. Coast Avifauna 7: 1-122. [III-Bird]

Willet, G. 1933. A revised list of the birds of southwestern California. Pac. Coast Avifauna 21: 1-204. [II, III-Bird]

Williamson, F. S. L. and L. J. Peyton. 1963. Interbreeding of Glaucous-winged and Herring Gulls in the Cook Inlet region, Alaska. Condor 65: 24-28. [III-Bird]

Woodbury, A. and K. Knight. 1951. Results of the Pacific gull color-banding project. Condor 53: 57-77. [III-Bird]

Woodhouse, C. April 1976. Pers. comm. Santa Barbara Museum of Natural History, Santa Barbara, California. [III-Ceta]

Wright, H. W. 1913. The birds of San Martin Island, lower California. Condor 15: 207-210. [III-Bird]

Wright, H. W. and G. K. Snyder. 1913. Birds observed in the summer of 1912 among the Santa Barbara Islands. Condor 15: 86-92.[III-Bird]

Yocum, C. F. 1947. Observations on bird life in the Pacific Ocean off North American shores. Condor 49: 204-208. [III-Bird]

☆U.S. GOVERNMENT PRINTING OFFICE: 1979-281-067/230

Townsend, C. H. 1912. The northern elephant seal. Zoologica 1: 159-173. [III-Pinn]

Townsend, W. C. 1968. Birds observed on San Nicolas Island, California. Condor 70: 266-268. [III-Bird]

Truitt, D. 1974. Dolphins and porpoises: A comprehensive annotated bibliography of the smaller cetacea. Detroit, Michigan: Gale Research Co. [III-Ceta]

Tuck, C. M. 1960. The murres, their distribution, populations and biology: a study of the genus Uria. Can. Wildl. Serv. Monogr. Ser. 1, Ottawa. [III-Bird]

Udvardy, M. D. F. 1963. Zoogeographical study of the Pacific Alcidae. In J. L. Gressit (ed.), Pacific basin biogeography, a symposium. Bishop Mus. Press, Honolulu. pp. 85-111. [III-Bird]

Unitt, P. 1975. Occurrence and migration of the Long-tailed Jaeger in North America. Ann. Mtg. Pac. Seabird Group (abstr.) [III-Bird]

U. S. Coast Guard, Airborne Radiation Thermometer Program. 1973-1976. Monthly charts of surface isotherms for southern California. [III-Bird]

Van Bree

Vedros, N. A., A. W. Smith, J. Schonewald, G. Migaki and R. C. Hubbard. 1971. Leptospirosis epizootic among California sea lions. Science 172: 1250-1251. [III-Pinn]

Venables, V. M. and L. S. V. Venables. 1955. Observations on a breeding colony of the seal Phoca vitulina in Shetland. Zool. Soc. Lond., Proc. 125: 521-532. [III-Pinn]

Venables, V. M. and L. S. V. Venables. 1959. Vernal coition of the seal Phoca vitulina in Shetland. Zool Soc. Lond., Proc. 132: 665-669. [III-Pinn]

Vermeer, K. 1963. The breeding ecology of the Glaucous-winged Gull (Larus glaucescens) on Mandarte Is., B. C. Occas. Paper B. C. Prov. Mus. 13. [III-Bird]

Vermeer, K. 1970. Breeding biology of California and Ring-billed Gulls. Can. Wildl. Serv. Rept. Ser. 12. [III-Bird]

Vermeer, K. and G. G. Anweiler. 1975. Oil threat to aquatic birds along the Yukon coast. Wilson Bull. 87: 467-480. [III-Bird]

Vermeer, R. and K. Vermeer. 1974. Oil pollution of birds: an abstracted bibliography. Pesticide Section, Can. Wildl. Serv. Rep. Ser. 29. 86 pp. [II, III-Bird]

Wagner, H. R. 1929. Spanish Voyages to the Northwest coast of America in the 16th century. San Francisco Calif. Hist. Soc. [III-Pinn]

Walker, W. A. 1975. Review of the live-capture fishery for smaller cetaceans taken in southern California waters for public display, 1966-1973. Jour. Fish. Res. Bd. of Can. vol. 32(7), July 1975. [III-Ceta]

Weghe, J. P. V. 1970. Identification of Common and Arctic Terns. Calif. Birds 1: 33-36. [III-Bird]

Wiens, J. A. and J. M. Scott. 1975. Model estimation of energy flow in Oregon coastal seabird populations. Condor 77: 439-452. [III-Bird]

Wilke, F. 1951. Preliminary Study No. 67, Gen. Hdqtrs. Supreme Comm. Allied Powers. cited in Bartholomew, G. A. and P. G. Hoel. 1953. Reproductive behavior of the Alaska fur seal, Callorhinus ursinus. Jour. of Mammal. 34(4): 417-436, p. 435. [III-Pinn]

Willet, G. 1910. A summer trip to the northern Santa Barbara Islands. Condor 12; 170-174. [II, III-Bird]

Willet, G. 1912. Birds of the Pacific slope of southern California. Pac. Coast Avifauna 7: 1-122. [III-Bird]

Willet, G. 1933. A revised list of the birds of southwestern California. Pac. Coast Avifauna 21: 1-204. [II, III-Bird]

Williamson, F. S. L. and L. J. Peyton. 1963. Interbreeding of Glaucous-winged and Herring Gulls in the Cook Inlet region, Alaska. Condor 65: 24-28. [III-Bird]

Woodbury, A. and K. Knight. 1951. Results of the Pacific gull color-banding project. Condor 53: 57-77. [III-Bird]

Woodhouse, C. April 1976. Pers. comm. Santa Barbara Museum of Natural History, Santa Barbara, California. [III-Ceta]

Wright, H. W. 1913. The birds of San Martin Island, lower California. Condor 15: 207-210. [III-Bird]

Wright, H. W. and G. K. Snyder. 1913. Birds observed in the summer of 1912 among the Santa Barbara Islands. Condor 15: 86-92.[III-Bird]

Yocum, C. F. 1947. Observations on bird life in the Pacific Ocean off North American shores. Condor 49: 204-208. [III-Bird]

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